Work Plan

Site Assessment Work Plan

Mechanics Valley Trade Center
North East, Maryland

KDI Corporation, Inc.

August 1988

O'BRIEN & GERE

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SITE ASSESSMENT WORK PLAN
MECHANICS VALLEY TRADE CENTER
NORTH EAST, MARYLAND

KDI CORPORATION, INC.

AUGUST, 1988

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8/5/88

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SECTION 1 - INTRODUCTION

1.01 Site Description and History

The Mechanics Valley Trade Center Site, formerly the Ordnance Products Inc. (OPI) site, is located in Cecil County at 1079 Mechanics Valley Road, approximately two miles northeast of the City of North East, Maryland. Figure 1 illustrates the location of the site with respect to local physical and cultural features. The site encompasses approximately 95 acres of wooded and open terrain including 58 separate buildings, several trailers, house trailers, and campers. Several ponds, streams, and disposal/burn pits are also present within the site (Figure 2).

OPI purchased the site in 1960 to manufacture, store and pack ordnance and ordnance products. In 1969 KDI acquired OPI and continued site operations until 1973. There were no operations on the site between 1973 and 1986 when the property was sold to the Mechanics Valley Trade Center, Inc. (MVTC), the current owner of the site.

The Maryland Department of the Environment (MDE) conducted preliminary investigations of the site in 1987 and concluded that drums of unknown liquids were stored in an unsafe manner. Additionally, MDE identified suspected landfills or burial areas containing hazardous substances, suspected "live" explosive materials, and contaminated soils, surface water, and ground water both on and off the site.

Based upon the data compiled by MDE, the United States Environmental Protection Agency (USEPA), in June, 1988, issued an Administrative Order (Exhibit A) pursuant to the authority of Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability

Act (CERCLA) of 1980, 42 U.S.C. Section 960(a) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. The order required KDI to take action necessary to protect the public health and welfare and the environment from the actual and/or threatened release of hazardous substances from the site.

This document presents a proposed Site Assessment Work Plan to evaluate the presence and extent of hazardous materials in the on-site soil and ground water, assess the environmental risk associated with identified hazardous materials and identify the most suitable means to remediate hazardous material sources and transport routes. This work plan has been prepared in compliance with paragraph E1 Section VIII of the Administrative Order (Exhibit A).

1.02 Previous Studies

The results of previous studies conducted at the site by the Maryland Department of the Environment, which revealed the presence of organic compounds in the environment, have been confirmed by a site assessment conducted on March 28, 1988, by EPA Region III's Office of Emergency Response. These studies involved an inspection of sites grounds and buildings for hazardous materials, and the sampling and analysis of soils, surface water, and ground water. In addition, residential wells in the vicinity of the site were also sampled and analyzed for contaminants. The following work plan reflects the information gained through a review of the EPA-TAT report for the Mechanics Valley Trade Center prepared by MDE and USEPA.

1.03 Site Assessment Objectives

The purpose of the Site Assessment is to develop a sufficient technical data base such that an evaluation of human health and environmental expenses can be performed and appropriate remedial options evaluated. This will be accomplished by meeting the following objectives:

a. Define the characteristics and horizontal and vertical extent of soil contamination at drum and suspected disposal sites;

b. Define the nature of contamination in plating ponds and site surface waters;

c. Define the source, nature, extent and rate of migration of ground water contamination;

d. Perform a Human Health and Environmental Exposure Assessment for identified soil, surface water and ground water contamination;

e. Evaluate remedial options.

SECTION 2 - PLANS AND MANAGEMENT

2.01 Project Management

A project management team has been assembled to implement and coordinate the site assessment. The project management team is illustrated on Figure 1. Mr. James Wickham, CHG, O'Brien & Gere Engineers, Inc. will act as project manager.

Progress reports will be submitted to USEPA by the project manager on a monthly basis. At a minimum, the progress reports will address the following: (1) status of work at the site and progress to date, (2) problems encountered during the reporting period which affect the project schedule, (3) actions being taken to correct problems, (4) activities planned for the next month, and (5) changes in key personnel.

2.02 Health and Safety Plan

A site Health and Safety Plan has been developed for this site plan in accordance with the 29 CFR 1910. This plan specifies the protective measures used by investigators and site visitors to minimize exposure to hazardous materials present at the site. The Health and Safety Plan is included as Appendix A.

2.03 Sampling Plan

The site specific sampling plan for the MVTC site has been prepared and is included as Section 3 in this work plan. The section discusses the locations, types and numbers of samples to be collected and in general, identifies all data collection activities.

2.04 Quality Assurance Project Plan

A site specific Quality Assurance Project Plan (QAPP) has been prepared and is included as Appendix B. This plan is consistent with USEPA guidance documents regarding the preparation of quality assurance plans. The plan addresses the following points:

1. Quality Assurance (QA) objectives for measurement data, in terms of precision, accuracy, completeness, representativeness and comparability.
2. sampling procedures
3. sample custody and chain of custody documentation
4. calibration procedures, references and frequency
5. internal laboratory Quality Control (QC) checks and frequency
6. QA performance audits, system audits, and frequency
7. QA report to management
8. preventative maintenance procedures and schedule
9. specific procedures to be used to routinely assess data precision, representativeness, comparability, accuracy, and completeness of specific measurement parameters involved, and
10. corrective action.

SECTION 3 - SITE ASSESSMENT WORK TASKS

3.01 Task 1 - Background Review

A review of available background information will be performed to assist in identifying potential sources and types of contaminants. The background review of the local geology and hydrogeology will also assist in a preliminary evaluation of environmental transport mechanisms that may affect the site. This review will include, but not be limited, to MDE and USEPA files, interviews with former employees, review of the updated residential well sampling survey, drum sampling and analysis data, historic aerial photos, a literature search and site reconnaissance. Additional information will be obtained from the following: United States Geological Survey, Maryland Geological Survey, Soil Conservation Service, and archive materials at local university libraries. Historic aerial photos for the purpose of identifying local surface water drainage patterns, former on-site waste disposal areas and bedrock fracture patterns are presently being obtained for the years 1952, 1957, 1964, 1971, 1973, 1979 and 1986.

3.02 Task 2 - Fracture Trace Analysis

A fractured bedrock aquifer apparently exists beneath the site as evidenced by well records provided by MDE. In order to select favorable locations for bedrock monitoring well installations, a fracture trace study and site reconnaissance will be conducted to identify fracture patterns in the vicinity of the site. The fracture trace study will be based upon an analysis of the U.G. Geological Survey 7.5 Minute Quadrangle topographic maps and available aerial photographs of the

area . Geologic structures identified by map and aerial photo inspection will be verified in the field to the extent practicable.

3.03 Task 3 - Geophysical Survey

A geophysical survey will be conducted at areas of concern within the site to define the presence and extent of suspected subsurface waste disposal excavations. Geophysical techniques to be employed will be magnetometer and terrain conductivity (EM). The following areas of concern identified in Attachment B of the USEPA Administrative Order (Exhibit A), and on Figure 2, will be subjected to geophysical surveys to determine the likelihood that bulk waste material was disposed of in the subsurface:

- Area C: the depression/hole and the possible disturbed area near the trailer in the open field
- Area D: pit in woods
- Area E: surface pile
- Area F: disturbed areas within woods which include a suspected surface and underground disposal area, two burn pits and various other disturbed areas
- Area H: suspected burial areas near the well #2
- Area I: suspected disposal area south of the Polo Pallet Co.

Surface materials will be removed, per the Drum and Material Removal Program (July 1988), prior to conducting the geophysical surveys. Each survey will involve both magnetometer and EM and will be conducted on either a traverse or a grid system with readings taken at a selected horizontal interval, ranging from 5 feet to 25 feet, sufficient to characterize the areal extent of each site. Each

geophysical survey will be conducted in accordance with the procedures outlined in the QAPP (Appendix B).

3.04 Task 4 - Interim Technical Memorandum

An Interim Technical Memorandum (ITM) will be prepared and submitted to USEPA upon the completion of Work Tasks 1 through 3. The ITM will discuss the methods of data collection, and evaluation and interpretation of that information. Recommendations and/or modifications will be made to the following Work Tasks (5 through 8), if deemed necessary, to revise the site specific sampling plan such that it more effectively addresses the goals of the site assessment. The interim technical memorandum will also identify the indicator parameters for each area of concern. The indicator parameters will be based on the results of the material characterization analysis performed during the implementation of the drum and material work plan, and will provide the basis for the laboratory analyses of subsequent tasks.

3.05 Task 5 - Site Soil Assessment

Based on the information obtained in Work Tasks 1 through 3, a site soil assessment will be conducted to characterize and evaluate the horizontal and vertical extent of soil contamination at drum and suspected disposal sites. The site soil assessment will address the following areas of concern identified in the USEPA Administrative Order (Exhibit A): A, B, C, D, E, F, H and I (Figure 2). For those areas where drums or other waste material is currently on the ground surface (Areas A, B, C, E, and F) the soil assessment will address the soil remaining following the removal of the waste material. Those areas

where subsurface disposal of bulk waste or drums is indicated by earlier work efforts will be subject to only an assessment of the surface soil. The methods used to sample each area will include the following:

a. Collection of surface soil samples (0 to 12 inch depth) to define the nature and horizontal extent of contamination at each site.

b. Drilling of test borings and collection of continuous soil samples from the ground surface to the first encountered ground water or bedrock surface to define the vertical extent of contamination at each site.

c. Laboratory analysis of selected samples for indicator parameters defined in the ITM (Task 4).

Soil samples from the test soil borings will be collected continuously using the ASTM D 1586-84/Split Barrel Sampling Method. The QAPP (Appendix B) outlines the drilling, sampling and equipment decontamination protocols. Laboratory analyses will be conducted on each soil sample for selected parameters, based upon site use records and the results of the drum sampling analysis.

Surface and subsurface soil samples will be described for soil type, color, texture, and evidence of contamination. In addition, soil samples will be screened for volatile organics using a photoionization detector (HNU Model PI-101 or equivalent). Based on the field observations and the sample location, selected samples will be submitted for laboratory analyses for the indicator parameters identified in Task 4.

Surface soil samples will be collected in appropriate sample containers and transported to the laboratory for analysis in accordance with the surface soil sampling protocol provided in the QAPP (Appendix B).

The number of samples submitted to the laboratory will be sufficient to determine the chemical nature and horizontal and vertical extent of any soil contamination. In addition, up to 5 background soil samples will be collected from the site and analyzed for comparison.

3.06 Task 5 - Site Surface Water and Sediment Assessment

The site surface water and sediment will be sampled to identify the type and extent of contamination, if any. The surface water and sediment will be sampled at selected locations within drainage ditches, plating ponds, and streams flowing through the site. The sampling methodology used to assess each of these locations will be as follows:

a. Collection of up to two surface water samples from each plating pond.

b. Collection of up to four sediment samples (0 to 12 inch depth) from each plating pond.

c. Collection of one upgradient and one downgradient surface water sample from each stream and drainage ditch at the site boundaries. If the stream or ditch originates or terminates within the site, samples will be collected at the upstream and downstream end.

d. Collection of one sediment sample proximate to each surface water sample at upgradient and downgradient locations.

Surface soil samples will be collected and transported to the laboratory for analyses in accordance with the surface water and sediment sampling protocol provided in the QAPP (Appendix B). Laboratory analyses will be conducted for selected parameters based upon site use records and the results of the drum sampling analysis.

3.07 Task 7 - On Site Ground Water Assessment

An evaluation of the site hydrogeology and ground water quality within the unconsolidated and the bedrock aquifers will be performed. This will be accomplished through the installation of ground water monitoring wells along the site perimeter. These wells will be sampled and analyzed for indicator parameters identified in Task 4. At a minimum, laboratory analyses will include those volatile organics identified using EPA Methods 601 and 602.

Up to six ground water monitoring well nests will be installed along the perimeter of the site (Figure 2). Each well nest will consist of two ground water monitoring wells; a shallow well installed in the ground water in the unconsolidated sediments; and a deeper well installed within the bedrock aquifer. The shallow wells are expected to be between 10 and 30 ft deep and will screen the upper 10 ft of the unconsolidated aquifer. The bedrock wells are expected to be installed to a depth of approximately 100 ft into bedrock provided the well yield is 1 gallon per minute or greater.

Up to three downgradient ground water monitoring wells will be installed at those waste sites where soil contamination was found to extend into the ground water table. These monitoring wells will be installed in the unconsolidated aquifer with 10 ft of screen.

The ground water monitoring well installations will be completed using conventional air, fluid rotary or hollow stem auger drilling methods in accordance with protocols in the QAPP (Appendix B). Split spoon samples will be collected every five feet or change in formation in the overburden wells.

The wells will be developed in accordance with the protocols included in the QAPP. Sampling and drilling equipment will be decontaminated in accordance with the QAPP. The drill cuttings and decontamination fluids will be disposed of on the ground surface unless visual or photoionization screening during drilling identifies the presence of contamination. Drilling cuttings and decontamination wastes which are determined to be contaminated will be placed into 55-gallon drums. Material from each monitoring well will be placed in separate drums. Each drum will be sealed and placed in a secure location on the site until an appropriate disposal method is determined based on the analytical results.

Following completion of the wells, the location and elevation of each monitor well will be surveyed. The locations will then be plotted on a site map for use in evaluation of the data and preparation of the report. The elevations of all well casings will be established to within 0.01 feet based on a USGS datum. Following the installation and survey of the ground water monitoring wells, ground water elevations will be measured quarterly in all monitoring wells for a period of one year. Ground water flow direction will be evaluated for both the unconsolidated and bedrock aquifers.

In-situ permeability tests will be conducted on each ground water monitoring well to estimate the horizontal hydraulic conductivity of the screened materials. These tests will be conducted in accordance with the protocols included in the QAPP (Appendix B).

The monitoring wells will be sampled in accordance with the procedures in the QAPP. The samples will then be transported to the

laboratory for analysis of selected parameters based upon site use records and the results of the drum sampling analyses.

3.08 Task 8 - Interim Technical Memorandum

Based on the data and information obtained from Work Tasks 5 through 7, a second interim technical memorandum will be prepared and submitted to USEPA and MDE. This memorandum will present the methods of data collection, evaluation and interpretation of the data. Recommendations for additional on-site sampling efforts, if necessary, will be presented. In addition, recommendations for the Off Site Ground Water Assessment (Task 9) will be presented.

3.09 Task 9 - Off Site Ground Water Assessment

If the on-site ground water assessment identifies contaminants at the site perimeter, the ground water hydrology and quality of the off-site ground water resources will be evaluated. This will be accomplished through the installation and sampling of additional ground water monitor wells. The additional monitoring wells, in conjunction with the data obtained from the residential wells, will be used to define the extent of off-site ground water contaminant migration.

3.10 Task 10 - Human Health and Environmental Exposure Assessment

A human health and environmental exposure assessment of the MVTC site will be performed by O'Brien & Gere environmental toxicologists and chemists, using existing and newly generated data. Current MDE and USEPA guidance will be followed in preparing the assessment. This assessment will evaluate the potential for sensitive

on-site or off-site receptor populations to be exposed to site contaminants at levels that may be harmful to human health and welfare or to the environment. This assessment is an essential component of the overall site investigation because it defines the level of impact potentially represented by the site. The human health and environmental assessment will unify the contaminant sources, transport routes, and receptor components associated with an environmental release and evaluate them. The completed assessment will determine the impacts associated with existing and potential releases of chemical components from the site under various scenarios.

The first phase of the evaluation (Level 1) will involve a qualitative assessment of the potential exposure pathway. This will include a characterization of the waste source and each of the relevant exposure pathways (i.e. air, surface water, ground water, direct contact, ingestion) for their potential to facilitate exposure of chemical components within the site to receptors identified at on-site and off-site locations. An important consideration at the MVTC site concerns the potential for off-site transport of waste constituents to off-site receptors via ground water underlying the site. The waste source characterization will consider such factors as site history, geology, and geography. The substances of concern will be characterized with regard to their occurrence based on monitoring data, the nature of their origin, and their environmental dynamics. Based on these considerations, as well as their toxicological properties, the substances of concern will be screened using guidance provided in the USEPA Public Health Evaluation Manual in order to select the compounds on which to focus the remainder of the assessment, i.e., the site indicator contaminants.

Transport scenarios determined to have a functioning contaminant source for site indicator compounds, transport mechanism, and human or wildlife receptors acting together such that exposure can occur are termed complete. These scenarios will be evaluated in the second, "quantitative", phase of the evaluation, if necessary. The quantitative assessment will be designed to provide an estimation of the probability and magnitude of each of the complete exposure pathways and the human health and environmental effects associated with those exposures. The approach used will be consistent with procedures and guidelines such as are included in the USEPA Public Health Evaluation Manual.

As noted above, a major factor in the assessment of the MVTC site will be the potential for waste constituents, particularly vinyl chloride, tetra- and trichloroethylene to migrate to and with the underlying ground water. To assess this possibility, existing data and prior data analyses will be reviewed. Using available measured source concentrations, physical/chemical properties of the waste constituents, biodegradation rates, site-specific soil permeability and retardation factors, and ground water velocity and volumes, an estimate of contaminant discharge will be made for use in the quantitative exposure assessment, as appropriate.

In addition, the site is currently being used for both industrial and residential purposes. As a result, the exposure pathways for soil/dust ingestion and inhalation, and inhalation of vapors released from soils will also be examined closely. Decision-making regarding remedial action is guided by health-based standards or criteria that are legally applicable or are relevant and appropriate, often termed ARARs (applicable or relevant and appropriate requirements). Drinking water

maximum contaminant levels (MCLs), National Ambient Air Quality Standards (NAAQS), federally approved state water quality standards developed under the Clean Water Act, EPA Health Advisories, and USEPA ambient water criteria (AWQC) are ARARs that are often used as target concentration levels. A list of ARARs will be submitted to USEPA and MDE for review and approval.

In those cases where measured or predicted concentrations do not meet or exceed the appropriate action level, it will be concluded that the exposure pathway poses no health risk to the receptor. If the action level is exceeded, further assessment will be performed in order to determine the magnitude of the impact associated with the exposure.

In some cases, action levels or standards for particular contaminants in various media are not available, This is particularly true in the case of soil and air contaminants, and for chemicals for which the existing data base is either insufficient to derive such values or is generally indicative of a lack of toxic potential at reasonable environmental concentrations. In these cases, an effort will be made to derive a technically acceptable action level, using the best available toxicity information and guidelines for quantitative health assessment developed by USEPA.

As part of the quantitative assessment, a sensitivity analysis will be performed with the objective of identifying the variable(s) in the exposure and other relationships employed which have the greatest impact on the results of the quantitative assessment. These variables could include ingestion and inhalation rates, length of exposure, ranges of contaminant concentrations, and ranges in threshold for various biological effects. Identification of these key variables permits a

presentation of the range of risk estimates with some estimate of the overall confidence in the analysis, and may indicate the need for additional data collection prior to any remedial effort undertaken at the site.

5.** Task ** - Site Assessment Report

A report will be prepared to present the results and interpretation of the site assessment. The report will include all the data collected, including the data obtained in previous studies.

SECTION 4 - EVALUATION OF REMEDIAL OPTIONS

The objective of the evaluation of remedial options will be to identify and evaluate appropriate remedial alternatives for the MVTC site using technical and economic criteria. The evaluation will result in the identification and conceptual design of a recommended remedial alternative.

The following sections describe the four components of the Evaluation of Remedial Options:

1) Identification of ARARs and Remedial Objectives

2) Development of Alternatives

3) Screening of Alternatives

4) Detailed Analysis of Alternatives

The discussions in the following sections are based on the most recent draft USEPA guidance document (OSWER Directive 9335.3-01, March 1988) which incorporated changes made by SARA, pending revision of the NCP by Congress.

4.01 Development of Remedial Objectives and ARARs

Remedial Objectives

The site assessment will have defined the contaminant concentrations and distributions, the extent of contamination, and the pathways of contamination. Site-specific remedial objectives will be developed based on public health and environmental concerns, information gathered during the site assessment, and Section 300.68 of the NCP. Concrete definition of the remedial objectives is essential to the

evaluation of remedial alternatives later in the evaluation of remedial options.

Remedial response objectives will be defined in terms of the contaminants, the pathways to be addressed, and the exposure criterion to be employed. Site remediation under SARA generally consists of a combination of treatment, engineering controls (i.e., containment), and institutional controls (i.e., fencing and deed restrictions). Four migration pathways are generally evaluated: direct contact, air, surface water, and ground water. At a site as complex as the MVTC site, a number of remedial objectives may be necessary to address all site contaminants and migration pathways.

Applicable or Relevant and Appropriate Requirements (ARARs)

While remedial objectives for soils and structures are often determined using a health-based assessment, the remedial objectives for surface waters, ground waters, and hazardous wastes are often expressed in terms of ARARs. Section 121(d) of CERCLA, as amended by SARA, requires that remedial actions comply with applicable or relevant and appropriate requirements or standards under federal and state environmental laws. Applicable or relevant and appropriate requirements (ARARs) are defined by USEPA (EPA memo 7/9/87, J. Winston Porter (OSWER Directive 9234.0-05)) as follows:

> "Applicable requirements means those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or other limitations promulgated under Federal or State law that specifically address

a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site."

"Relevant and appropriate requirements means those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site."

There are three types of ARARs: chemical-specific, location-specific, and action-specific. The most recent USEPA guidance specifies that chemical-specific and location-specific ARARs will be identified as part of the Site Assessment, and only action-specific ARARs are identified in the evaluation of remedial options. These types of ARARs are further defined below:

Chemical-specific ARARs establish health or risk-based concentration limits or ranges in various environmental media for specific hazardous substances, pollutants, or contaminants. These requirements may set cleanup levels for specific substances for particular media, or may establish discharge limits for remedial actions incorporating treatment and release via air emission or wastewater discharge.

Location-specific ARARs set restrictions on activities based on the characteristics of a site or its immediate environs. Action-specific ARARs set controls or restrictions on particular types of actions related to management of hazardous substances, pollutants, or contaminants.

Compliance with chemical-specific ARARs is required upon completion of remedial action for hazardous substances, pollutants, or contaminants which remain on-site. Additionally, chemical-specific ARARs may dictate the amounts of hazardous substances that may be emitted or discharged during treatment. Compliance with location-specific ARARs may eliminate particular technologies from use at the MVTC site. Compliance with action-specific ARARs is required while the remedial action is being implemented and may dictate how remedial actions are conducted.

Compliance with all ARARs is required unless a waiver is invoked. ARARs may be waived if one or more of six waiver conditions is met, and protection of human health and the environment remains assured. The six waiver conditions are: fund-balancing, technical impracticability, interim remedy, greater risk to health and the environment, or inconsistent application of state or federal standards.

4.02 Development of Alternatives

The development of alternatives for the MVTC site will entail: a) identifying general response actions and associated potential treatment and/or containment technologies, b) prescreening of suitable technologies, and c) assembling technologies and/or disposal combina-

tions into alternatives. The potential response actions and associated remedial technologies are as follows:

Response Action	Potential Remedial Technologies
1. No Action	Monitoring, Fencing, Site Use Limitations (Institutional Controls)
2. Containment	Dams, Ground Water Barriers, Bulkheads, Capping, Sealing
3. Pumping	Ground or Surface Water Pumping, Sediment Dredging
4. Collection	Sedimentation Basins, Subsurface Drains, Gas Vents, Gas Collection
5. Diversion	Dikes, Berms, Grading, Stream Diversion, Ditches, Terraces, Chutes, Downpipes
6. Complete Removal	Excavation of Wastes, Soil, Sediment, Tanks, Drums, Liquid Wastes
7. Partial Removal	Selected Excavation of Wastes, Soil, Sediment, Tanks, Drums, Liquid Wastes
8. On-Site Treatment	Biological, Chemical or Physical Treatment, Incineration, Solidification, Land Treatment, Vitrification

9.	Off-Site Treatment	Treatment/Storage/Disposal Facility, Incineration, Solidification, Vitrification
10.	In-Situ Treatment	Permeable Treatment Beds, Bio-Reclamation, Neutralization, Landfarming, In-situ Vitrification
11.	Storage	Temporary Structures
12.	On-Site Disposal	Landfill, Land Application
13.	Off-Site Disposal	Landfill, Land Application
14.	Alternative Water Supply	Cisterns, Above Ground Tanks, Deeper/Upgradient Wells, Municipal Water, Relocation of Intake, Specific Treatment Devices
15.	Relocation.	Temporary/Permanent Location of Animal Populations

These potential response actions and associated specific technologies will be screened based on suitability to the circumstances of the MVTC site, and unsuitable technologies will be eliminated from further consideration. Specifically, screening of technologies will focus upon performance, reliability, implementability, and applicability, as described below.

1. Performance. The performance criterion evaluates the effectiveness of the technology relative to meeting the remedial response objectives. It also evaluates the ability of a technology to function over the expected life of the remedial action and the "track record" of a technology to perform its intended function. In addition, the presence of other contaminants can affect the performance of a technology designed to address a specific constituent.

Technologies that have not been fully demonstrated under the conditions at the MVTC site will be eliminated from further consideration unless state or federal regulatory agencies have an interest in funding a demonstration project at the site. However, innovative technologies are carried through to the next phase of the evaluation if there is good reason to believe that they could offer better treatment or implementability, fewer or lesser adverse impacts, and/or lower costs than other demonstrated technologies.

2. Reliability. The reliability criterion evaluates the ability of a technology to perform its intended function. Included in this assessment is an appraisal of the frequency and complexity of operation and maintenance (O&M) activities required for the technology to remain effective.

3. Implementability. The implementability criterion evaluates the feasibility of implementing a technology under site conditions. Site conditions that could affect implementability include the proximity of residential areas, the location of the water table, the distance to a POTW, the capacity of the POTW, and the floodplain location. In addition, the presence of other contaminants can affect the implementability of a technology to address a specific constituent. Other factors to be considered are the ease of construction of the technology and the safety practices required during and after construction to minimize exposure to workers and neighbors.

4. Applicability. The applicability criterion evaluates the appropriateness of a technology relative to site chemical and physiographic conditions. Technologies which exhibit a limited effectiveness because of waste and/or site characteristics are eliminated from further consideration.

A technology must meet all four criteria to pass the technology screening phase. The general response actions and associated remedial technologies which pass the technology screening step, as well as those which are screened out, will be tabulated for the MVTC site.

The technologies will then be combined into remedial alternatives to address all site problems. The grouping of alternatives under the existing NCP is:

1) An off-site alternative;

2) An alternative that attains ARARs;

3) An alternative that exceeds ARARS;

4) An alternative that does not attain ARARs; and

5) A no action alternative.

A recent draft USEPA guidance document (OSWER Directive 9335.3-01, March 1988) has incorporated changes made by SARA, so that the Evaluation of Remedial Options for the MVTC site will instead consider the following groupings of alternatives:

1) Alternatives that employ treatment which reduces toxicity, mobility, or volume as a principal element;

2) At least one alternative in which engineering controls comprise the principal element; and

3) A no action alternative.

The developed treatment alternatives should provide a range of approaches with varying degrees of effectiveness. One end of this range would be represented by an alternative that utilizes treatment to the extent that long-term management requirements are eliminated or reduced to the maximum extent feasible. The other end of the range would entail an alternative that employs treatment to reduce a principal

threat posed by the site; such an alternative would not involve treatment of all waste or the highest degree of treatment.

4.03 Initial Screening of Alternatives

The screening of alternatives step will reduce the number of alternatives for the MVTC site while preserving a range of viable choices. The screening will be conducted on the basis of effectiveness, ease of implementation, and cost. The intent of screening will be to eliminate alternatives within the same category that are significantly less implementable or more costly than comparably effective alternatives. The list of potential remedial alternatives will be reduced through this screening effort and those alternatives which pass this point are subjected to detailed analysis. The no action alternative is also carried through to the detailed analysis step.

According to SARA, effectiveness is related to the overall performance of an alternative in reducing toxicity, mobility or volume of a waste through the use of treatment technologies; long-term effectiveness and permanence; short-term impacts which the alternatives may pose during implementation; and how quickly the protection an alternative offers can be achieved. Any alternatives that do not protect human health and the environment to an acceptable degree will not be carried through the initial screening of alternatives.

Implementability is associated with the difficulty in constructing a particular alternative given the conditions at the MVTC site. The time necessary to complete a remedial action is subject to a number of technical, administrative and logistical problems. An alternative which

would be more difficult or time consuming to implement than a comparably effective remedy will not be carried through the initial screening of alternatives.

Cost factors include costs necessary to construct a remedial action and any operating and maintenance costs associated with an action. Cost will be used only within a particular alternative category to eliminate alternatives which provide results which can be achieved through another less costly method. Order of magnitude cost estimates will be developed for the initial screening.

4.04 Detailed Analysis of Alternatives

The detailed analysis of alternatives will involve a comparison of the most promising subset of alternatives using specific factors to evaluate the criteria of effectiveness, implementability and cost.

The selection of an ultimate remedy will result from a balancing of several considerations, including:

1. Overall protection of human health and the environment
2. Compliance with applicable or relevant and appropriate requirements (ARARs) of federal, state, and local laws.
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume
5. Short-term effectiveness
6. Implementability
7. Cost
8. State and community acceptance

These factors are discussed in detail below.

1) Overall protection of human health and the environment: This criterion will address existing or potential risks posed by the MVTC site to ensure that such risks will be adequately reduced or controlled. Protectiveness will be achieved by reducing exposures to acceptable levels, but not necessarily by cleaning up a specific medium to that level.

2) Compliance with potentially applicable or relevant and appropriate requirements (ARARs): This factor involves the ability to meet chemical, location and action-specific ARARs. A preference will be given to technologies that can achieve ARARs.

3) Long-term effectiveness and permanence: A preference will be given to alternatives that minimize residual risks following remediation, based on the persistence and degree of control of remaining hazardous constituents and degree of permanence of the alternative. Consideration will be given to the appropriateness and adequacy of any control technologies used to manage residual threat(s), and the potential impact on human health or the environment in the event of failure of those technologies.

4) Reduction of toxicity, mobility or volume: This factor will include an evaluation of whether an acceptable and permanent degree of reduction will be achieved, and to what degree.

5) Short-term effectiveness: This consideration will include an evaluation of how quickly the remedy would provide its intended protection, the effects to site workers during remedial activities, and any potential cross-media impacts.

6) Implementability: This factor will include an evaluation of short-term reliability, ability to monitor effectiveness, ability to perform intended purpose, operation and maintenance requirements, and limitations on the season in which the action can occur.

7) Cost considerations. The cost data developed as part of the screening of alternatives will be refined further to provide estimates within +50 percent to -30 percent, including detailed estimates of capital costs, annual operation and maintenance costs, and 30-year present worth value.

Capital costs include additional or more accurate detail on construction, land development, buildings and services, relocation of affected populations, preparation of specification and bid documents, and permitting and legal costs. Annual operating costs are further detailed to include operating labor, maintenance materials and labor, transportation and disposal of residuals, administration, insurance, taxes and license fees, reserve funds for maintenance and contingencies, costs of 5-year reviews (e.g. sampling and monitoring analyses), and potential future remedial actions. The analysis of present worth of each alternative allows capital and annual operating costs to be compared on a consistent basis. A discount rate of 5 percent and an economic life of 30 years will be used for present worth calculations.

A sensitivity analysis will be conducted to determine the effect of varying specific assumptions on the effectiveness, implementability, and cost of each alternative. Some of the as-

sumptions which may be varied in the sensitivity analysis include the effective life of the remedy, O&M costs, present worth discount rate, duration of treatment requirements, availability of off-site disposal or treatment facilities, and uncertainties regarding site conditions (e.g. volume of buried or contaminated wastes, etc.

8) State and community acceptance: Compliance with location-specific ARARs or the need for permit approval in case of off- site actions will be evaluated.

The outcome of the detailed analysis will be a recommendation of the remedy which is the most protective of human health and the environment; in compliance with environmental statutes (or provides grounds for a waiver); and cost-effective. In performing the necessary balancing of the different factors in the analysis, preference is given to the alternative(s) which offers the most permanent solution, in accordance with SARA. SARA created a preference for remedial actions which reduce toxicity, mobility, or volume of hazardous substances. SARA also requires that Superfund site remediations employ permanent solutions and alternative treatment technologies to the maximum extent practicable.

4.05 Conceptual Design

A conceptual design of the recommended remedial alternative shall describe the engineering approach, including an implementation schedule, special implementation requirements, institutional requirements, phasing and segmenting considerations, preliminary design criteria, preliminary site and facility layouts, budget cost estimate (including

operation and maintenance costs), operating and maintenance requirements and duration, and an outline of the safety plan including cost impact on implementation. Any additional information required as the basis for the completion of the final remedial design for the UVTC site will also be included. The conceptual design of the recommended remedial alternative will be presented in the Evaluation of Remedial Options report as described in Section 4.06.

4.06 Final Report

The Evaluation of Remedial Options will result in the preparation of a Final Report which will document the evaluation and assessment process and will recommend an alternative to be implemented at the former OPI site.

The Report will contain the following:

- A summary of all public health and environmental hazards and potential hazards attributable to the site contaminants. This summary will reference the Human Health and Environmental Exposure Assessment portion of the Site Assessment Report.
- Identification of remedial actions necessary to eliminate or minimize existing or potential hazards.
- Identification of component remedial technologies capable of achieving the remedial objectives for each applicable alternative.
- A discussion of the initial screening of alternatives.
- The detailed description of alternatives, technical evaluation, and cost estimates prepared in the final evaluation.

In addition, the Evaluation of Remedial Options report will specify the names, titles, and disciplines of all professionals engaged in the preparation of the report, and will include references to all scientific or technical literature used in preparing the report.

The Evaluation of Remedial Alternatives report will be submitted to MDE or USEPA within 60 days after receipt of approval of the Site Assessment Report. Following this review, a meeting will be held with MDE or USEPA to discuss review comments. A final report will then be prepared and submitted to MDE or USEPA.

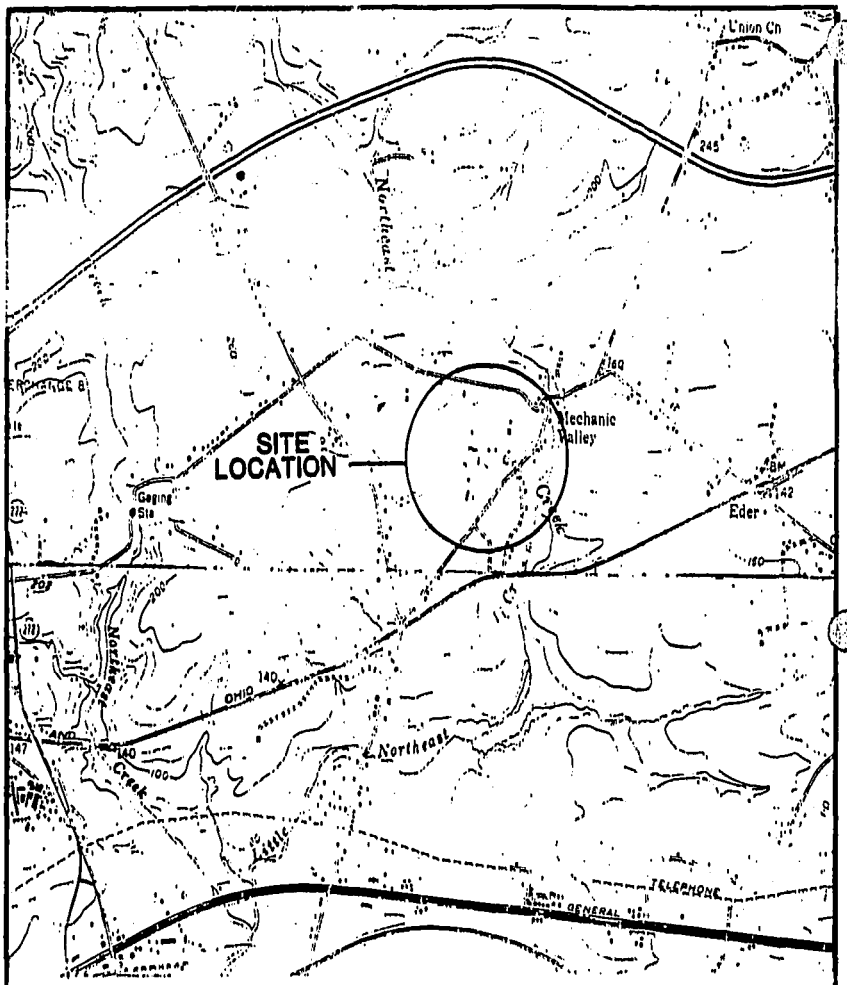
Two other deliverables that will be submitted to MDE or USEPA in conjunction with the Evaluation of Remedial Options: 1) The remedial objectives will be developed concurrently with the last stages of the Site Assessment and will be submitted in a separate letter shortly after the submission of the draft Site Assessment Report, and 2) A list of potential component remedial technologies will be submitted in the early stages of the Evaluation of Remedial Options for review and comment by the state regulatory agency.

SECTION 5 - PROJECT SCHEDULE

5.01 Project Schedule

The project schedule, presented in Figure 3, represents an estimate of the time necessary to complete the tasks outlined in the work plan. The first interim technical memorandum (Task 7) will be completed within approximately 5 months of approval of the site assessment work plan. The second interim technical memorandum (Task 8) is scheduled to be completed within 14 months of initiating the site investigation. Prior to completion of the site assessment report, scheduled to be completed within 22 months of approval of the work plan, an evaluation of remedial options will begin.

FIGURE 1



MECHANICS VALLEY TRADE CENTER

NORTH EAST, MARYLAND

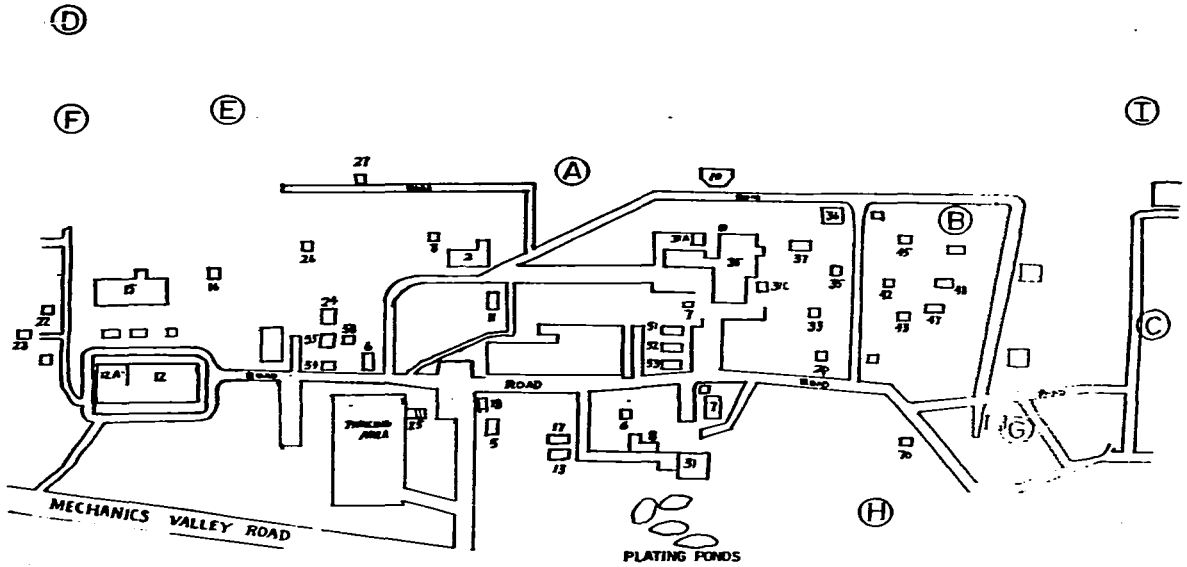
SITE LOCATION MAP

SCALE:

2000 0 2000 4000

1 IN. = 2000 FT.

NOTE: ADAPTED FROM NORTH EAST, MD. AND BAY VIEW, MD.-PA. 7.5 MINUTE U.S.G.S. TOPOGRAPHIC MAPS.



A-I AREAS OF CONCERN
● LOCATIONS OF PROPOSED MONITORING WELL NESTS

O'BRIEN & GERE ENGINEERS, INC.
Syracuse, New York

MECHANICS VALLEY TRADE CENTER
NORTH EAST MARYLAND
NOTE: NOT TO SCALE

PRJ NO 4057.002
DATE 7-22-88

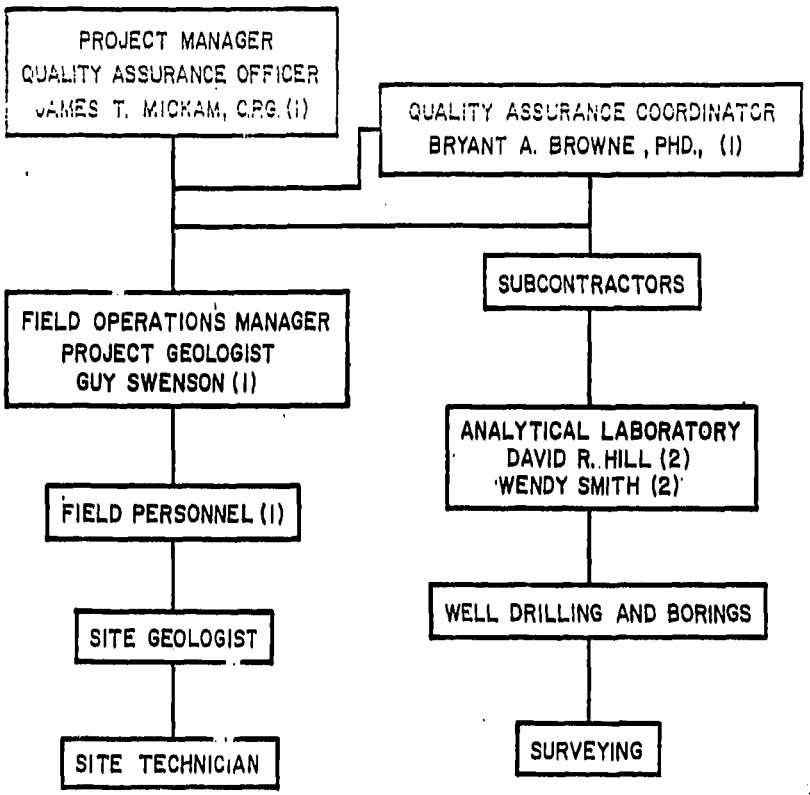
FIGURE 2

AR100411

216

FIGURE 3

PROJECT ORGANIZATION CHART



(1) OBRIEN & GERE ENGINEERS, INC.

(2) OBG LABORATORIES, INC.

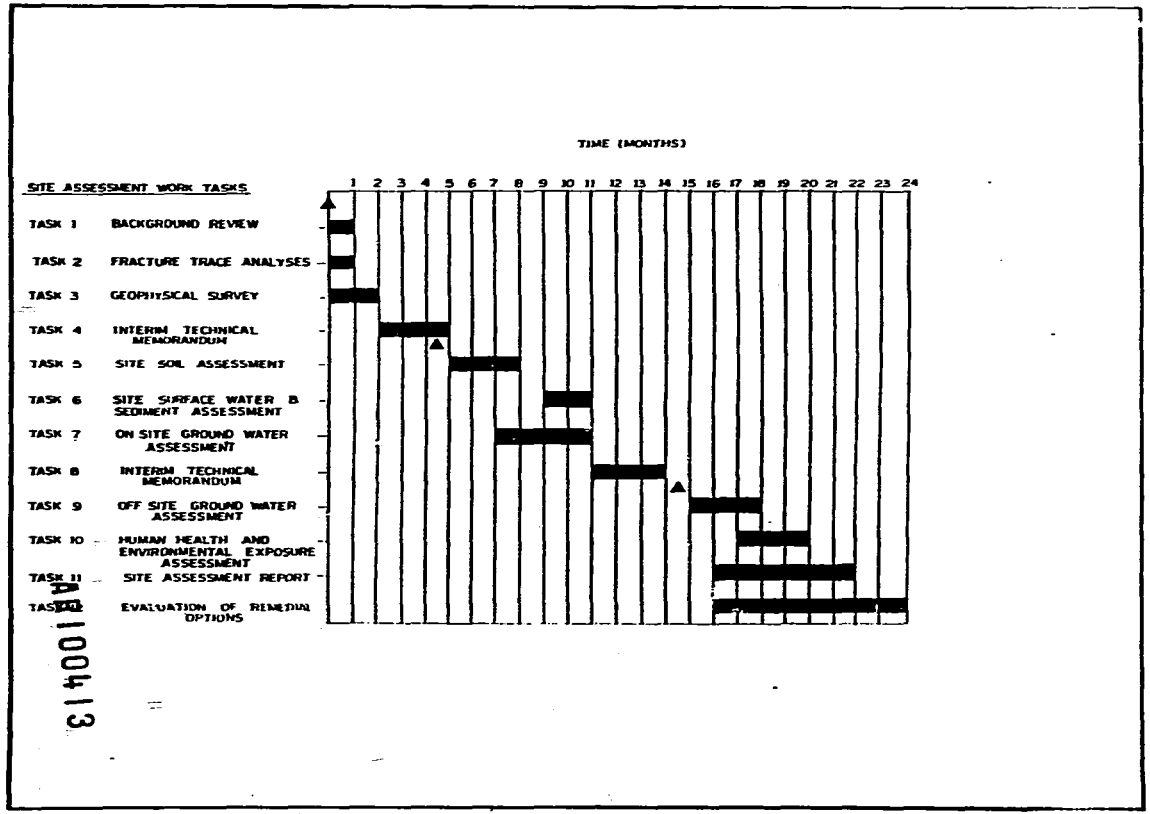


FIGURE 4

SITE ASSESSMENT WORK PLAN
PROJECT SCHEDULE

MECHANICS VALLEY TRADE CENTER

NOTES

WORK TIME PERIOD

▲ USEPA REVIEW AND APPROVAL

DIRENZO & ASSOCIATES

APPENDIX A

HEALTH AND SAFETY PLAN

MECHANICS VALLEY TRADE CENTER
NORTH EAST, MARYLAND

AUGUST, 1988

HEALTH AND SAFETY PLAN
MECHANICS VALLEY TRADE CENTER
SITE ASSESSMENT

SECTION 1 - BACKGROUND

1.01 Application

This general health and safety plan covers the site assessment activities at the Mechanics Valley Trade Center (MVTC) Site located at 1079 Valley Road, north of North East, Maryland, in Cecil County. This Plan applies to all employees of O'Brien & Gere Engineers, Inc. and any contracted or subcontracted personnel involved in any onsite activities as part of the site assessment operations. This plan also applies to individuals with specific prior authorization from O'Brien & Gere who visit the site for the purpose of observing site assessment operations. Based on the nature of the area, this Plan has been developed in compliance with OSHA regulations pertaining to hazardous waste operations, as specified in 29 CFR 1910.120. Based on observations made during drum and surface material inventory activities currently being implemented, this plan will be updated and modified, as necessary, to define specific protocols to be followed during Site Assessment Operations. An addendum to this Health and Safety Plan will be presented within the Interim Technical Memorandum (Task 4 of the Site Assessment Work Plan).

This Health and Safety Plan covers exposures to non pyrotechnic materials only. The handling of pyrotechnic materials will be carried out by personnel of UXB International. Health and safety requirements

for handling of pyrotechnic materials will be presented in a separate work plan developed by UXB.

1.02 Site Assessment Work Plan

The objective of the NVTC Site Assessment field activities covered herein is to define the nature and extent of contamination in soils, ponds and surface waters, sediments, and ground water on-site. The scope of this effort is outlined in the Site Assessment Work Plan. As described in this plan, field efforts under this phase of the project will include literature and map reviews, as well as a geophysical survey of the site. Sampling and chemical analysis will be conducted on surface soils, subsurface soil borings, ground water, plating pools, surface water, and associated sediments.

1.03 Project Personnel

Project Manager	James T. Mickam O'Brien & Gere Engineers, Inc. Syracuse, NY (315) 451-4700
Senior Project Hydrogeologist	Guy Swenson O'Brien & Gere Engineers, Inc. Syracuse, NY (315) 451-4700
Health and Safety Coordinator	Swiatoslav W. Kaczmar, Ph.D., C.I.H. O'Brien & Gere Engineers, Inc. Syracuse, NY (315) 451-4700

(On-Site Health and Safety Officer to be named later)

1.04 Safety and Health Risk Analysis

1.04.1 Anticipated On-Site Conditions

Field Activities are expected to begin in August 1988 and continue through October. Anticipated weather conditions for this time period are warm temperatures (60-90°F), and moderate to low precipitation. Seasonal vegetative ground cover will be at a maximum.

1.04.2 Materials of Concern

At the present time, information is insufficient to adequately identify and define all the materials of health and safety concern and their locations at the MVTC site. Chemical analysis carried out as part of the drum and surface material removal activities will provide a more detailed description of possible on-site contaminants which may be of concern. However, based on preliminary investigations conducted by the Maryland Department of the Environment (MDE), the following non-pyrotechnic materials have been identified in the soils and/or groundwater:

a. Tetrachloroethene
b. Trichloroethene (TCE)
c. Trans 1,2 dichloroethene
d. Vinyl Chloride
e. 1,2 dichloroethane

Due to their toxicity and volatility, these substances could represent hazards of exposure by inhalation or direct contact during site assessment activities.

The possibility also exists for the presence of inorganic chemicals including acids and metal compounds e.g. barium chromate, used in metal plating operations and in the production of pyrotechnic materials. Acid fumes as well as other inorganic hazardous materials may present a potential for direct contact or inhalation hazard.

The above list of materials of concern will be updated as more detailed information is obtained about the site, and will be presented in the Interim Technical Memorandum.

1.04.3 Intended On-Site Activities

Intended on-site Activities will include:

- Fracture trace analysis Verification (visual surficial geologic assessment)
- Geophysical survey (non-intrusive)
- Surface soil sampling and soil boring advancement
- Surface water and sediment sampling (including plating ponds)
- Ground water sampling

Descriptions of these activities are provided in the body of this work plan. Following the completion of a pyrotechnic material inventory, the pyrotechnic and explosives specialist (UXB International) will submit a site specific work plan for the handling and removal of all on-site pyrotechnic materials. This plan will specifically address Health

and Safety requirements for all personnel handling pyrotechnic materials found on-site.

NOTE: The on-site handling of pyrotechnic materials will be carried out by crews from UXB International. These crews are specially trained in the identification and handling of pyrotechnic and other ordnance materials. All UXB personnel will be under direct supervision of expert ordnance personnel graduated from the Naval Explosive Ordnance School at Indian Head, Maryland. It is assumed that UXB will have completed their efforts and removed the pyrotechnic and ordnance materials before this project is initiated. If, after this, evidence of pyrotechnic materials is found, personnel involved in site assessment operations will leave the site and UXB will be called to address the situation.

1.04.4 Air Monitoring Program

Potential airborne contaminants of concern include organic vapors, pyrotechnic materials residues, and/or contaminated soil particles and acid gases. Of these, quantitative monitoring is to be conducted for organic compounds during Site Assessment activities. Airborne residue and/or soil particles will be addressed using preventative measures (respiratory protection) and visual observation. Due to the lack of accessible real-time monitoring equipment for particulate matter, (i.e. heavy metals) a conservative approach for respiratory protection is to be employed. Upon visual observation of air-borne particulate matter

associated with on-site activities, a water spray will be applied to the area to control dust/particulate matter generation, as applicable.

Preliminary organic monitoring is to be accomplished using a photoionization detector (HNU Model PI-101 or equivalent), properly calibrated and equipped with an eV (10.2 eV) energy lamp appropriate for the inspected chlorinated aliphatic compounds of concern.

If HNU readings should indicate total VOC concentrations in excess of the prescribed limits set forth in the next section, Draeger tubes and associated hand pumps will be employed as deemed necessary by the Health and Safety Officer for the quantification of specific compound concentration.

Initially, organic vapor monitoring will be done every quarter hour during all activities in the areas of the plating ponds and waste disposal pits. In all other areas, during operations involving soil disruption, organic vapor concentrations are to be monitored at the start of each activity and each half hour thereafter. The monitoring schedule may be modified as deemed appropriate by the Health and Safety Officer in order to promote the safe and efficient execution of all tasks.

1.04.5 Criteria for Selection of Protective Equipment

The levels of personal protective equipment required for the field investigation will depend on the location and type of sampling performed and the type and degree of hazardous materials for each area of activity. Field activities, such as well installation and sampling, surface and subsurface soil sampling, and plating pond sampling, have the propensity to initiate the release of volatile organic compounds (VOCs).

For this reason, HNU monitoring will be performed during all such activities on-site. This monitoring will serve to:

1. grossly characterize the concentrations of volatile chemical constituents encountered during field activities.
2. provide a basis for downgrading or upgrading the level of personal protection.
3. indicate any conditions that may be unsafe to on-site personnel and the surrounding environment.

Activities which disturb the soil surface, such as those associated with the drilling of wells or the advancement of soil borings, present the risk of agitating contaminated dusts and particles into the immediate work environment. Therefore, during such intrusive work in contaminated areas (the boundaries of these areas to be defined by the Health and Safety Officer or designee thereof), half-face respirators shall be equipped with HEPA cartridges in addition to any other protective equipment deemed necessary.

The sampling of plating ponds and the advancement of soil borings through suspected waste pits presents the highest risk of exposure. During these operations level C protection, as defined in the next section, will be used with a full-face respirator with organic/acid vapor and HEPA dust cartridges. These cartridges will prevent the inhalation of particulate bound materials as well as low concentrations of organic compounds. In addition, if during boring advancement or pond sampling, HNU readings rise above background levels, a Draeger tube determination of the concentration of the compounds listed in section 1.04.3 will be performed. If concentrations of vinyl chloride greater than 1 ppm are detected, organic/acid vapor cartridges will be replaced

with vinyl chloride cartridges. Concentrations of unknown VOCs detected greater than 80 ppm will require level B protection.

Activities conducted in areas remote from waste disposal areas will require level D protection as a minimum, since airborne contamination is not expected to be present. In these areas, air monitoring will be conducted and the data will be evaluated by the Health and Safety Officer on-site, and protection upgrades will be implemented at the officer's discretion.

1.04.6 Record-Keeping of Data

All observations and air monitoring results are to be recorded in the field notebook/daily log book, to be kept by the Project Team Leader, or his designee.

1.04.7 Comparison to Standards

In order to evaluate the real-time air monitoring data to be obtained, a direct comparison of these data will be made to the applicable Occupational Safety and Health Administration, Permissible Exposure Limits which are based on an 8-hour time-weighted average. Comparison of instantaneous field data to 8-hour averages will result in very conservative criteria for PPE selection and guideline limits for the workers in the field. Adequate protection will thereby be afforded without implementing the use of in-field 8-hour exposure concentrations. Respiratory protection requirements will be mandatory for HNU readings in excess of 1 ppm based on the PEL of vinyl chloride.

1.04.8 Protective Equipment

O'Brien & Gere personnel will be provided with appropriate personal safety equipment and protective clothing. Each individual will be properly trained in the use of this safety equipment before the start of field activities. Safety equipment and protective clothing shall be used as directed by the Site Safety Officer. Such equipment and clothing shall be cleaned and will be maintained in proper condition by project personnel. Levels of personal protection and the selection of criteria pertinent to field activities during the RI/FS are detailed below.

Protective footware and clothing will be required at all times during this investigation. Protective headgear and necessary hearing protection will be worn during operation of all heavy equipment. Eye protection shall be worn when the potential for a splash or for flying particles exists due to site activities. Types of protective clothing and equipment to be used are given on the following pages.

Personal protective equipment required for operating in each zone and area is in conformance with EPA criteria for Level B, C, and D protection. The respiratory protective equipment used will be approved by NIOSH/MSHA. The types of equipment and clothing to be worn as part of the various levels of protection are given below:

Level B Protection

a. Pressure demand cascade air system or other suitable self-contained, pressure demand breathing apparatus (all personnel requiring respiratory protection are to be trained on the SCBA to be used in the field)

b. Chemical-resistant clothing(Poly-coated Tyvek), long sleeves, one piece, (hood will be available)

c. Outer Viton and inner "medical" latex gloves (both chemical resistant)

d. Steel-toe boots with rubber overboots

e. Options as required:

1. Coveralls (cloth)

2. Disposable outer boots

3. Face shield

4. Escape mask as appropriate

5. Hard hat

Level C Protection

a. Full-face air purifying respirator equipped with appropriate canister or cartridges see Section 1.04.6 (all personnel requiring respiratory protection are fit tested with the respirator to be used in the field, and must be approved for use of a respirator following a pulmonary function test).

b. Chemical-resistant clothing (Poly-coated Tyvek), long sleeves, one piece, (hoods will be available).

c. Outer Viton and inner "medical" latex gloves (both chemical-resistant)

d. Steel-toe boots with rubber overboots

e. Options as required:

1. Coveralls

2. Disposable outer boots

3. Escape mask

4. Hard hat

5. Face shield

Level D Protection

a. Full-face/half-face air purifying respirator equipped with appropriate canisters or cartridge must be available for use; and all potential users trained and medically approved for such use.

b. Long sleeve work shirt and long pants (work pants or jeans)

c. Steel-toe boots

d. Options as required:

   1. Work gloves
   2. Disposable outer boots
   3. Safety glasses or chemical splash goggles
   4. Hard hat

1.05 Site Control Measures

1.05.1 Site Map

Figure 1 excerpted from the EPA's Administrative Order to KDI Corporation displays the overall MVTC site. Each numbered area refers to those specific areas targeted for the field investigation. Site control zones for a specific area, building or structure will be established in the field by the Health and Safety Officer. The following zones are to be established for each area, (the degree of definition of each is dependent on the logistics, ground cover, topography, etc. at each area):

- Exclusion Zone - where field investigative activities take place
- Contamination Reduction Zone - where personnel and equipment are decontaminated, as dictated in Section 1.07.4. All passage of personnel and equipment from the Support Zone (see below) to the Exclusion Zone must be through the

Contamination Reduction Zone, in order to control the potential spread of onsite contamination.

- Support Zone - where support facilities, extra equipment, transport vehicles, etc. are located. This includes any area which is not under consideration as potentially contaminated areas within the site.

1.05.2 Site Security

Security at each area shall be addressed by the following measures:

1. Permission for entry shall be obtained prior to any work in the area. A written copy of such permission shall be kept with the field personnel at all times, for inspection by concerned parties.
2. The Project Team Leader, or his designee, must approve all visitors to the area. Any visitors within the Exclusion Zone must meet the Training requirements of this Plan, and be suited in the appropriate protective equipment, as specified in Section 1.04.9 of this Plan.
3. For those work areas on which equipment and materials must be left overnight, security may be provided for in the form of fencing or other barriers, posting of hazardous conditions, or any other measures as deemed necessary by the Project Team Leader.
4. General surveillance by those personnel involved in site work shall provide for onsite security during field activities.

1.05.3 Communications

Visual communications during site work will be difficult due to the large area to be covered during the investigation. Therefore, two-way radio communication between the Project Team Leader and each group of onsite investigators must be maintained at all times of onsite activities, particularly when visual contact is not possible. The following visual signals will be used as a back-up system:

- Wave arms above head - "come here, need help"
- Hands to throat - "person down, call for medical help"
- Hands on hips - "everything is fine"

Directives for site activities will be given by the Project Team Leader, and oversight designated to the appropriate field personnel. Oversight of health and safety measures will be maintained by the Health and Safety Officer, or an onsite designee.

1.06 Health & Safety Programs

1.06.1 Training Requirements

Personnel engaged in any onsite operations must have received, at a minimum, 40 hours of classroom training for hazardous waste operations, as required in 29 CFR 1910.120. Included in this must be training in the appropriate use and care of respiratory protective equipment, as specified in 29 CFR 1910.134 as well as Red Cross training in Emergency First Aid and CPR.

1.06.2 Medical Surveillance

All personnel engaged in any onsite activities which require the use of respiratory protective equipment must have medical approval for

the use of such equipment prior to site work. In addition, all O'Brien & Gere Engineers, Inc. employees must be participating in the Medical Surveillance Program, which requires annual physicals for approval for hazardous waste site work.

1.6.3 Standard Operating Procedures

1. Safe Work Practices

Common sense and caution must be used in avoiding potentially unsafe situations encountered during site activities. The use of heavy equipment, the presence of unstable structures, uneven topography, traffic, ground cover, thick brush and trees, and the size of the areas necessitates the exercise of caution in avoiding and preventing all potentially unsafe conditions. The following standing orders shall be adhered to by all personnel involved in the project:

- no eating, drinking or smoking in the Contamination Reduction Zone or the Exclusion Zone
- no matches or lighters in the Contamination Reduction Zone or the Exclusion Zone
- always follow the Buddy System in the Exclusion Zone
- if any unusual conditions are discovered, including the evidence of pyrotechnic materials, leave the area immediately and report the finding to the Project Team Leader and the Health and Safety Officer.
- in all areas in which the hazard of explosive materials exists, only UXB personnel will conduct work on-site.

- all portable electric equipment used onsite must be properly bonded and grounded. Such equipment should only be used in areas in which there is no hazard from the presence of explosive materials.
- all equipment must be checked at the start of each work day to ensure that it is in good working order.

2. Buddy System

All onsite work will be conducted in pairs. The buddy system must be used in order to ensure that a visual check, assistance and emergency help is always present for every onsite worker.

3. Entry & Exit

- Entry into the Exclusion Zone shall follow the outline below:
  1) Don appropriate protective clothing and equipment.
  2) Notify Health and Safety Officer of intended operations; review of PPE by H & S Officer.
  3) Log in - entry time and date in field log book.
  4) Enter through one point, at one end of the Contamination Reduction Zone - the Entry & Exit Point.
- Exit from the Exclusion Zone shall follow the outline below:
  1) Notify onsite personnel, including buddy, of intent to leave.
  2) Exit through the Entry & Exit Point.
  3) Decontaminate equipment and clothing, as specified in the next section.

4) Log out - record time and date in field log book.

1.06.4 Decontamination Procedures

1. Personnel

All personnel wearing personal protective equipment (Level B or C, used onsite(s) must go through decontamination before leaving the area. Decontamination is to proceed as follows:

(1) Wash outer boots and gloves in detergent wash water.

(2) Rinse outer boots and gloves in rinse water. Damp wipe disposable suit to remove particulates.

(3) Remove outer boots and gloves and set aside on clean area or plastic sheet.

(4) Remove and dispose of outer suit.

(5) Remove and clean respirator. Dispose of used cartridges and filters.

(6) Remove and dispose of inner gloves. (Cloth gloves may be re-used, but must remain dedicated to the site).

(7) Wash hands and face.

2. Equipment

(See QAPP Section 4)

All decontamination waste waters will be collected and disposed of according to applicable regulations.

1.06.5 Illumination Requirements

All field work will be conducted during daylight hours, thus eliminating the need for portable lighting facilities. Entry into any

onsite buildings will also be done during daylight, with high-intensity flashlights to be used a a supporting light source.

1.06.6 Sanitation Provisions

With permission from the owner/operator, sanitary accommodations for field personnel will be the available facilities in the nearby Ryland Homes office building onsite. A field wash station as part of the decontamination procedures will be set up at each work area, as required.

1.06.7 Heat Stress/Cold Exposure

Precautions to be taken against heat stress include:

- training in the recognition and treatment of the various forms of heat stress for all onsite personnel;
- access to adequate supplies of cool water and electrolyte-rich beverages for all workers;
- prudent work/rest scheduling;
- availability of a shaded rest area (to include the field vehicle);
- self-monitoring of pulse by all workers in Level C protective equipment. As a general guideline, a pulse of 110 beats per minute or greater, following a rest period, is a signal to shorten the next work cycle by a third.

Precaution to be taken against excessive cold exposure include:

- training of all onsite workers in the recognition and treatment of cold exposure;
- availability of a warm, dry rest area.

Most field work activities are anticipated for the months of August through October, thus making cold exposure a minimal concern.

1.07 Contingency Plan

1.07.1 Emergency Communications

In all emergency situations, notification of the situation should immediately be made to the Project Team Leader (PTL) and the Health and Safety Officer (H&SO). The PTL must notify the appropriate emergency personnel from the nearest phone. Once the appropriate emergency response personnel have been summoned, the Project Team Leader must assign someone to stand watch for the response vehicle(s) and lead them to the problem/victim. The H&SO must report the incident as soon as possible to the Project Manager in the O'Brien & Gere Syracuse office.

A mobile phone and/or two-way radio will be available in the vehicle used during the site investigations. This vehicle shall serve as a base station for workers out in the field areas.

1. Phone Numbers

O'Brien & Gere Office (Syracuse)	(315) 451-4700
O'Brien & Gere Technical Services	(315) 451-1331
UXB (John Boyden)	(703) 385-6622
US Environmental Protection Agency (Chris Thomas)	(215) 597-4458
Police Department (North East Maryland)	(301) 287-5996
Fire Department (North East Maryland)	(301) 398-2222

Ambulance 911

Union Hospital (Elkton, Maryland) (301) 398-4000

Alternate Hospital Christiana

Medical Center (Delaware) (302) 733-1000

2. Chain of Command (Onsite)

Guy Swenson (or designee)

Designated Health and Safety Officer

1.07.2 Anticipated Emergency Situation(s)

Potential onsite emergencies include the following:

1. Medical problems;
2. Minor physical injury, such as cuts, bruises, etc.;
3. Over exposure to toxic materials, whether by inhalation, ingestion or direct contact;
4. Fire and/or explosion related to ordnance materials.

The potential for such emergencies will be addressed by preparation for first aid response, personal protective equipment, the use of intrinsically safe equipment, pre-selection of boring sites, and extreme caution.

1.07.3 Safe Refuge

1. Onsite

   The vehicle/base station, shall serve as the safe place of refuge in the event of an emergency.

2. Directions to Hospital - Union Hospital (301 - 398-4000)

   Mechanics Valley Road to Rt. 40

   Turn left on Rt. 40

Go through 1st traffic light

Turn left at second traffic light

Go through 1st traffic light and turn right

Go through next traffic light, hospital is up about 1/2 block on right

3. Directions to Hospital-Christiana Medical Center [illegible]

Mechanics Valley Road to 195 North

Take 1st exist after Christiana Mall Exit

Go straight on Rt. 7 and take left at traffic light (TOYS 'R' US on right, Days Inn straight ahead)

Go straight through 2 traffic lights and signs will show directions to hospital

1.07.4 Site Security & Control

Site security and control shall be maintained as described in Section 1.06, at the direction of the Project Team Leader and the Health and Safety Officer.

1.07.5 Emergency Response & Decontamination

In case of an emergency, all personnel will evacuate to safe refuge, both for their own personal safety and to prevent hampering response/rescue efforts. In case of an evacuation, the Health and Safety Officer will assign one individual the responsibility of accounting for the personnel at the vehicle/base station and reporting back if anyone is missing. A log of the individuals entering and leaving the site will be kept to insure that everyone can be accounted for in an emergency.

To operate smoothly, emergency response should follow a sequence of operations from notification, through appropriate response and ending with follow-up actions. These actions are necessary to both document the incident and prevent its reoccurrence. A flowchart of the emergency response process is illustrated in Figure 1, Flowchart of Emergency Response. First aid equipment, fire extinguishers, eye wash stations and other emergency equipment will be located in the vehicle/base station situated near the work area and decontamination area.

1.07.6 Medical/First Aid Response

Required medical treatment may range from bandaging of minor cuts to providing life-saving first-aid and immediate medical transport. The personnel need to be familiar with the location of first-aid kits and other emergency equipment. If possible, immediate medical care should be provided by individuals trained in first aid procedures. In case of a medical emergency, the Health and Safety Officer must be notified immediately. On-site medical assistance is to be directed by the Health and Safety Officer. If outside medical assistance is required the appropriate rescue squad and medical center must be contacted. In case of an injury involving a hazardous chemical, a copy of this Health and Safety Plan is to be sent with the individual to the medical center.

1.07.7. Fire-Fighting Procedures

Fire extinguishers are located in the vehicle/base trailer. Fire extinguishers should be used only for small fires in the early stages of development. Where the fire cannot be controlled through extinguisher

use, the area should be evacuated immediately. The appropriate outside response agency should be called. It is important to note that a relatively small fire has the potential to produce an explosion due to the nature of the onsite contaminants.

1.07.8 Emergency Decontamination Procedures

The extent of decontamination to be done in an emergency situation is determined by the type and severity of the illness or injury and the nature of the contamination. Immediate decontamination is to be done when it is an essential part of life-saving first-aid but should not be done if it would instead interfere with necessary medical treatment.

If decontamination can be done: wash, rinse, and/or cut off protective clothing and equipment. In all cases of contact exposure, the contaminated clothing and/or equipment must be removed immediately. If decontamination cannot be done (only in a case of inhalation exposure), wrap the victim in blankets, plastic, or other barrier materials to reduce the potential for contamination of other personnel. In addition, emergency and offsite medical personnel need to be alerted to specific decontamination procedures to follow.

1.07.9 Follow-up Procedures

Before normal site activities are resumed, personnel must be fully prepared and equipped to handle another emergency. Any necessary emergency equipment must be recharged, refilled, or replaced. Government agencies, such as OSHA, EPA, DOT, and state agencies, must be notified as appropriate.

An investigation of the incident needs to be conducted as soon as possible. The report may be used as training and information tools to prevent a future recurrence, as evidence in future legal action, for assessment of liability by insurance companies, and for review by government agencies. Therefore, the document needs to be accurate, objective, complete and authenticated (signed and dated).

Personnel entering the site will be informed about emergency procedures. Visitors will be briefed on basic emergency procedures such as decontamination, emergency signals, and evacuation routes. Personnel without defined emergency response roles will receive training which includes: hazard recognition, understanding of emergency procedures, knowledge of evacuation routes and how to report an emergency. Off-site emergency personnel who are potential first responders will be informed about site-specific hazards, appropriate response techniques, site emergency procedures, and site decontamination procedures. Finally, personnel with defined emergency response roles will receive training appropriate to those roles.

APPENDIX B
QUALITY ASSURANCE PROJECT PLAN (QAPP)

MECHANICS VALLEY TRADE CENTER
NORTH EAST, MARYLAND

AUGUST, 1988

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 AR100441

SECTION 1 - INTRODUCTION

The following Quality Assurance Project Plan (QAPP) has been prepared for the Site Assessment at the Mechanics Valley Trade Center (MVTC) Site located in North East, Maryland. It was prepared in accordance with U.S. EPA's "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans", QAM-005/80, 29 December 1980. This QAPP addresses sampling efforts associated with the tasks described in the Work Plan. Analytical methods are not identified in this document. Indicator parameters will be selected following the sampling and characterization of drummed material on site, which is considered indicative of the contaminants present throughout the site. Analytical methods and QA/QC protocols (e.g. Test Methods for Evaluating USEPA approved Solid Wastes, EPA 1986) will be selected based on the indicator parameters and will be presented in an Interim Technical Memorandum (Task 4 Site Assessment Work Plan).

SECTION 2 - PROJECT ORGANIZATION AND RESPONSIBILITY

While all personnel involved in an investigation and in the generation of data are implicitly a part of the overall project and quality assurance program, certain individuals have specifically designated responsibilities. Within C Brier & Gerr these are the Project Manager, the Quality Assurance Coordinator, the Field Operations Manager, and the Field Environmental Technicians. OBG Laboratories, of Syracuse, New York will provide all analytical services for these investigations. Specific laboratory personnel with quality assurance/quality control responsibilities include the Laboratory Quality Assurance Coordinator and Laboratory Sample Custodian. Figure B-1 presents a project organization chart.

2.01 Project Manager/Quality Assurance Officer

Mr. James T. Mickam, CPGS is Project Manager for the MVTC Site Assessment. The Project Manager will maintain routine contact with the investigation's progress, regularly review the project schedule, and review all major work elements prior to submittal. Mr. Mickam will also serve as Quality Assurance Officer (QAO) for this investigation, with the responsibility of overseeing the day-to-day activities of all work to be conducted including that of subcontractor personnel. The Project Manager will oversee the scheduling and budgeting, and serves as the prime contact with state, local and federal agencies. The Quality Assurance Officer has primary responsibility for the project quality assurance activity. The Quality Assurance Officer's responsibilities include coordinating the development, evaluation, and documentation of

the Quality Assurance Project Plan and procedures appropriate to the investigation. It is a major responsibility of a Quality Assurance Officer to insure that all personnel have a good understanding of the project quality assurance plan, an understanding of their respective roles relative to one another, and an appreciation of the importance of the roles to the overall success of the program.

2.02 Quality Assurance Coordinator

O'Brien & Gere's Bryant A. Browne, Ph.D., will serve as Quality Assurance Coordinator. It is the Quality Assurance Coordinator's responsibility to review project plans and revisions to the plans to assure proper quality assurance is maintained. Frequent and regular meetings will take place between the Quality Assurance Coordinator and the Project Quality Assurance Officer to review all quality assurance activities. The Quality Assurance Coordinator is also responsible for all audits, data processing activities, data processing quality control, data quality review, data validating, and overall quality assurance.

Additionally, Dr. Browne will serve as the manager of environmental chemistry evaluations for the project and will be responsible for reviewing all chemical data, validating laboratory analytical data and coordinating the efforts between O'Brien & Gere and OBG Laboratories.

2.03 Field Operations Manager/Project Geologist

O'Brien & Gere will assign a competent and experienced hydrogeologist as the Field Operations Manager/Project Geologist prior to the start of work. The Field Operations Manager/Project Geologist reports directly to the Project Manager and is immediately responsible

for the day-to-day activities of all O'Brien & Gere field personnel. In this capacity, the Field Operations Manager/Project Geologist is responsible for all day-to-day quality assurance project activities and reports directly to the Project Manager concerning the maintenance of the Quality Assurance Project Plan. Further responsibilities include the initialing and verification for accuracy of field notebooks, driller's logs, chain-of-custody records, sample labels, and all other field-related documentation. Mr. Guy Swenson, Senior Project Hydrogeologist for O'Brien & Gere, will be assigned the responsibilities of Field Operations Manager/Project Geologist.

2.04 Site Geologists and Technicians

Ground water, soil, and air sampling tasks required by this investigation will be conducted by experienced geologists and/or environmental technicians. Their responsibilities will include the documentation of the proper sample collection protocols, sample collection, field measurements, equipment decontamination, and chain-of-custody documentation.

2.05 OBG Laboratories Quality Assurance Coordinator

The volume of analytical work for a project of this size necessitates the subcontract analytical laboratory to specify a Quality Assurance Coordinator whose duties are specific to the project. Mr. David R. Hill will serve as OBG Laboratories' Quality Assurance Coordinator with the responsibility for maintenance of all laboratory quality assurance activities in association with the project.

2.06 Laboratory Sample Custodian

Ms. Wendy Smith will serve as project Laboratory Sample Custodian for OBC Laboratories, Inc. The sample Custodian's responsibilities include insuring proper sample entry and sample handling procedures by laboratory personnel.

SECTION 3 - QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA IN TERMS OF PRECISION, ACCURACY, REPRESENTATIVENESS, COMPARABILITY, AND COMPLETENESS

Data quality requirements are based on the intended use of the data, the measurement process, and the availability of resources. Data quality requirements include detection limits, accuracy, precision, and quality assurance protocols for the analytical method to be used and the analyses to be conducted. Ground water, soil, and surface water samples collected in association with this investigation will be analyzed for those indicator parameters selected after a review of drum sampling and waste characterization efforts. Table B-1 lists the holding times for the analyses to be conducted. Analytical methods, data quality requirements, reporting limits, and quality assurance protocols and objectives will be presented in an Interim Technical Memorandum after the selection of the indicator parameters.

The quality of all data generated and processed during this investigation will also be assessed for representativeness, comparability, and completeness based upon the available external measures of quality. The data quality assessments are qualitative determinations. The methods to be used in assessing the data quality relevant to the field-generated data for the investigation (non-analytical) are as follows:

- Representativeness - Use of USEPA recommended procedures for the collection and preservation, referenced in EPA 600/4-79-020, Methods for Chemical Analysis of Water and

Wastes, the Federal Register, 26 October 1984 and CLP SOWs (8/87).

- Comparability - The use of consistent procedures, reporting units, standardized methods of field analysis, and standardized data format with document control.
- Completeness - Obtaining all required data as outlined in the Work Plan.

Precision and accuracy for the field pH and conductivity are dependent on the type and condition of the instrument used and the care used in the standardization and operation. The precision and accuracy objectives for the instrumentation used are according to manufacturers recommendations as follows:

- pH precision will be ±0.3 pH standard units and an accuracy of ±0.3 pH standard units.
- Conductivity precision will be ±3 umhos/cm on the 500 umhos/cm range, ±25 umhos/cm on the 5,000 umhos/cm range, and ±250 umhos/cm on the 50,000 umhos/cm range.

Trip blanks described in Section 9 of this QAPP will be subjected to the same quality assurance objectives as samples. These blanks are expected to be below detection limits for all analyses.

Data quality assessments (Sections 9, 10, and 12) will be performed on a routine basis to evaluate whether the data quality objectives of the investigation are being met. Should these assessments reveal specific data unacceptable quality, corrective actions will be implemented on a case by case basis as described under Section 13 (Corrective Action).

SECTION 4 - SAMPLING PROCEDURES

The generalized sampling procedures used by O'Brien & Gere are presented as Attachment B-1, "Standard Operating Procedures for the Collection of Environmental Samples". These procedures have been standardized to allow applicability to a wide range of environmental investigations. Sampling procedures associated with the ground water, soil, and surface water at the MVTC site will be conducted according to Attachment B-1.

4.01 Ground Water Sampling Procedures

In addition to the information presented in Attachment B-1, the general site-specific protocols for the MVTC site are presented in this section.

4.01.1 Preparation for Sampling

Preparation for sampling includes the acquisition of all necessary monitoring equipment and site-specific information to perform the required monitoring. Prior to initiating any sampling activities, a complete round of depth to water levels will be measured to the nearest 0.01 ft.

Total well depths necessary to calculate the required purge volumes will be tabulated in Table B-2 after the completion of the installations.

4.01.2 Well Evacuation

Monitoring wells will be evacuated for a minimum of three volumes of water standing in the well casing or for low yielding wells, until the well goes dry prior to sample acquisition. The volume of water to be purged for each well will be calculated as described in Attachment B-1.

Either a submersible pump, bladder pump, positive displacement pump or bailer will be used to evacuate the monitoring wells. Pump placement depth will be dependent on well yields. High yielding wells will necessitate placement of the pump intake at the top of the water column. Low well yields require pump placement to be at the bottom of the well. Proper pump placement will insure complete and proper evacuation. Upon completion of the required purge volume, the pumping system will be removed from the well. Wells that are inaccessible with the pump system will be hand bailed using a bottom-loading stainless steel bailer.

4.01.3 Sample Acquisition

Sample acquisition will be as described in Attachment B-1. Bottom-loading stainless steel bailers will be used to collect ground water samples for transfer into the proper sample containers. If well yields are low at the site, the samples will be collected as the well recovers and provides a sufficient volume for sample collection. The portion of sample required for analysis of volatiles will be collected first.

4.02 Split Spoon Soil Sampling

The Work Plan addresses collection of soil samples from test borings and well borings.

After the VOA samples are collected, the remaining split spoon sample will be divided into two aliquots. The aliquots will be homogenized and placed (using a stainless steel spatula) in appropriate glass bottles for field screening analysis.

4.03 Surface Soil Sampling

The surface soil samples described in the Work Plan will be collected using a split spoon sampler. Leaves, twigs, and debris will be cleared from the surface of the sampling location. The shallow soils (0-12 in.) will be homogenized, and transferred directly into the sample containers. Samples for volatile analysis will not be homogenized.

4.04 Decontamination

Decontamination procedures will be applicable to all drilling and sampling activities. All drilling and well construction equipment mobilized to the MVTC site will receive initial decontamination. Decontamination will consist of steam cleaning of the entire rig to the satisfaction of the supervising geologist.

The rear portion of the drill rig will be decontaminated by steam cleaning between test borings and/or monitoring well installations. In addition all equipment entering a test boring or well boring but not used for sample collection, will be decontaminated using a steam cleaning followed by a control water rinse.

Sample collecting equipment contacting soil and/or rock samples will be decontaminated after each use by a low phosphate detergent

brushing followed by a clean water rinse. Carbon steel split spoons will then be rinsed in a 1% Nitric Acid solution and rinsed with clean water. A methanol rinse followed by a final rinse with demonstrated analyte free deionized water will complete the decontamination procedure. Solvents used for decontamination will be pesticide grade or better and will be stored separately from the demonstrated analyte free deionized water.

It may be necessary to insert hoses and/or narrow diameter pipe into test borings and wells during installation, development, purging, and sampling. These items will also be decontaminated initially, and after each use. The hoses will be cleaned with soapy water and rinsed with deionized water. Decontamination procedures required for site personnel will be described in the Health and Safety Plan.

4.05 Sample Preparation and Preservation

Ground water and surface water samples, if collected for metals analysis, will be collected and field filtered. Field filtering will be accomplished through a 0.45 um membrane (cellulose ester) filter prior to preservation to allow determination of dissolved metals. The filtering system used will be cleaned before and between samples with 10% HNO_3 solution and deionized water.

Immediately after collection, samples will be transferred to properly labeled (see Section 5 of this QAPP) sample containers with all necessary preservatives will be added. Samples receiving pH adjustment will be checked with pH paper to ensure the proper pH has been achieved. Table B-3 lists the proper container materials, volume requirement, and preservation needed for the MVTC site analyses.

Samples requiring refrigeration for preservation will be immediately transferred to coolers packed with ice or ice packs. All samples will be shipped within 24 hours of being collected. Proper chain-of-custody documentation will be maintained as discussed in Section 5 of this QAPP.

SECTION 5 - SAMPLE CUSTODY

The primary objective of sample custody procedures is to create an accurate written record which can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. Sample custody for samples collected during this investigation will be maintained by the Field Operations Manager (FOM) or the field personnel collecting the samples. The FOM or field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are delivered to the laboratory.

Sample bottles and preservatives will be supplied by OBC Laboratories, Inc. A self-adhesive sample label and a sample tag will be affixed to each container before sample collection. At a minimum, the sample tag will contain:

- Client - Job name
- Sample identification station number (place of sampling)
- Date and time collected
- Sampler's signature
- Testing required
- Preservatives added
- Sample Type
- Grab or Composite

Immediately after sample collection, the sample will be placed in an insulated cooler for delivery to the laboratory within 24 hours. O'Brien & Gere field Chain-of-Custody records completed at the time of sample collection will accompany the samples inside the cooler for delivery to

the laboratory. The forms will include the project name, sampling station number, and sample location. These record forms will be sealed in a ziplock plastic bag to protect them against moisture. Each cooler will contain sufficient ice and/or ice packs to insure that proper temperature of approximately 4°C is maintained, and will be packed in a manner to prevent damage to sample containers. The shipping container will be secured with nylon strapping tape and custody sealed before shipment. The custody seals will be placed on the containers so they cannot be opened without breaking the seal. The samples will be properly relinquished on the field Chain-of-Custody record by the sampling team to the FOM. The FOM will then, in turn, relinquish the samples to the OBG Laboratories Sample Courier. When routine sampling is performed and the FOM is not present, custody will be relinquished by the responsible field personnel.

OBG Laboratories will provide sample pickup at the O'Brien & Gere office daily or on an as-needed basis. The OBG Laboratories Courier will then relinquish the samples to OBG Laboratories Sample Custodian. Upon receiving the samples, the Laboratory Sample Custodian will inspect the condition of the custody seal and samples, compare the information on the sample label against the field Chain-of-Custody record, assign an OBG Laboratories control number, and log the control number into the OBG Laboratories computer sample inventory system. OBG Labs will maintain custody of samples as described in the above sections.

When samples requiring preservation by either acid or base are received at the laboratory, the pH will be measured and documented. The Laboratory Sample Custodian will then store the sample in a

secure sample storage cooler maintained at 4°C and maintain custody until assigned to an analyst for analysis.

The Laboratory Sample Custodian will note any damaged sample containers or discrepancies between the sample label and information on the field Chain-of-Custody record when logging in the sample. This information will be communicated to the PCM or field personnel so proper action can be taken. The Chain-of-Custody form will be signed by both the relinquishing and receiving parties each time the sample changes hands, and the reason for transfer indicated.

A serially numbered internal Chain-of-Custody form will be used by OBG Laboratories to document sample possession from the Laboratory Sample Custodian to Analysts and final disposition. The Chain-of- Custody information will be supplied with the analytical reports for inclusion in the document control file.

SECTION 6 - CALIBRATION PROCEDURES AND FREQUENCY

6.01 Laboratory Calibration Procedures

Equipment Calibration, References and Frequency

All field equipment used during this project will be calibrated and operated in accordance with manufacturer's instructions. Any field equipment used during this project that is not covered by the investigator's standard operating procedures will have a specific calibration and operation instruction sheet prepared for it.

A. General

Standards may be generally grouped into two classifications: primary and secondary. Primary standards include United State Pharmaceutical (USP), National Bureau of Standards (NBS), American Society for Testing and Materials (ASTM) materials, and certain designated EPA reference materials. All other standards are to be considered secondary.

B. Testing

1. Primary: No testing is necessary. Do not use if there is any physical indication of contamination or decomposition (i.e. partially discolored, etc.).
2. Secondary: Examine when first received either by comparison to an existing primary, or comparing known physical properties to literature values. The less stable standards will be rechecked at appropriate intervals, usually six months to one year.

C. Records

1. A records book will be maintained for each grouping of standards (i.e. pesticides, metals, etc.)
2. The record kept for each standard will include:
   a. Name and date received
   b. Source
   c. Code or lot number
   d. Purity
   e. Testing data including all raw work and calculations
   f. Special storage requirements
   g. Storage location
3. These records will be checked periodically as part of the Laboratory Controls Review.

Equipment

A. General

1. Each major piece of analytical laboratory instrumentation used on this project is documented and on file with the analytical laboratory.
2. A form is prepared for each new purchase and old forms will be discarded when the instrument is replaced.

B. Testing

1. Each form details both preventative maintenance activities and the required QA testing and monitoring.
2. In the event the instrument does not perform within the limits specified on the monitoring form, the Laboratory Manager will be notified and a decision made as to what action to take.

3. If repair is deemed necessary, an "out of order" sign will be placed in the instrument until repairs are effected.

6.02 Calibration Records

A bound notebook will be kept with each instrument requiring calibration, to record all activities associated with a maintained, QA monitoring and repairs program. Additionally, these records will be checked during periodic equipment review.

6.03 Field Calibration

In addition to the laboratory analyses conducted during the course of this investigation, field measurements of pH, specific conductance, and temperature will be taken for all surface and ground water samples. Where necessary, an photoionization detection meter will be used to measure volatile organics in air or soils.

The frequency of field calibration procedures will, at a minimum, include the following:

- The pH and specific conductance meters will be calibrated at a minimum of once daily and documented in a calibrator's field book. Calibration will be checked as necessary to insure proper measurements are taken.
- pH meters will be calibrated using specific techniques according to the manufacturer's instructions and two standard buffer solutions (either 4, 7, or 10) obtained from chemical supply houses. The pH values of these buffers will be compensated for temperature according to the values supplied on

the manufacturer's bottle label. The temperature (measured as below) at which the sample pH was measured will then be used to compensate for temperature on the meter.

- Temperature measurements will be performed using field thermometers (Thomas Science No. 9220A10).
- Specific conductance meters will be calibrated using a 1413 umho (KCl) solution prepared by OBG Laboratories according to Standard Methods of the Analysis of Water and Wastewater, 16th Edition, 1985-Method 205, 3b, page 79.

SECTION 7 - ANALYTICAL PROCEDURES

All analytical procedures to be used will be officially approved USEPA procedures. The appropriate procedures and methods will not be presented at this time. Indicator parameters will be selected following a review of [illegible] sampling and characterization efforts. Once the indicator parameters have been selected, the analytical methods and QA/QC protocols will be presented in an Interim Technical Memorandum (Task 4 Site Assessment Work Plan).

SECTION 8 - DATA REPORTING, VALIDATION, AND REDUCTION

8.01 Data Reduction

OBG Laboratories, Inc. will be performing analyses on the environmental samples. The following data handling procedures are employed at OBG Laboratories, Inc.

A. Gas Chromatography/Mass Spectrometry: 1) A Hewlett-Packard Model 5987A GC/MS equipped with a Tekmar Model 400 Dynamic Head Space concentrator and a RTE6 VM Operating System and, 2) a 5996 HP GC/MS with a 7672A HP Auto Sampler and a RTE6 VM Operating System are used for positive identification and quantification of volatile organics and sample extracts. Both instruments use an aquarius software package for data reduction. Output from the GC/MS units is processed for presentation in three formats:

1) A real-time total multiple ion mass chromatogram.
2) A post-run investigation report containing the following:
   a. Retention time
   b. Response factor
   c. Primary, secondary and tertiary ion with their correspondings abundance
   d. Quantitation ion
   e. Reference library name
   f. Concentration
3) A visual comparison of the subject mass spectral output to the library compound.

The post integration report contains the following:

1) Listing of all compounds.

2) Relative retention times.

3) Relative response factor to their internal standards.

Quality Assurance/Quality Control data such as resolution and calibration standards and DFTPP spectra are also processed and stored in the above manner.

B. Gas Chromatography: A Hewlett-Packard Model 5880A Gas Chromatograph (GC) equipped with an Electron Capture Detector and a 7673A H.P. Auto injection system is used for positive identification and quantification of sample extracts.

Output from the GC unit is processed for presentation in two forms:

1) A real time chromatogram

2) A post-run integration report containing the following:

   a. Retention time

   b. Response factors calculated from standards

   c. Surrogate standard reservoir

   d. Listing of all positively identified compounds

Quality Assurance/Quality Control data such as spikes, spike duplicates, and calibration curves are also processed and stored in post integration reports.

C. Trace Metals: A Varian model 575 Atomic Absorption Spectrophotometer (AA) and Perkin-Elmer Model 3030B Atomic Absorption Spectrophotometer with an HGA600 furnace are used for the low level detection of metals by conventional flame and graphite furnace techniques.

The atomic absorption spectrophotometer for inorganic pollutants is calibrated using appropriate calibrating standards and blanks. The calibrations are checked by analyzing synthetic standards at five different concentration levels.

The results are used to generate standard curves by least squares fit of the data via computer programs. The deviation of the standards from the least squares fit (standard curves) and the standard deviation of the fit are printed on the daily printout and the data stored accordingly in appropriate computer bases. If deviations from accepted values occur, analysis of sample and instrumental calibrations are repeated. Standard curves are generated regularly.

D. Spectrophotometry: Spectrophotometric instruments are initially calibrated with commercially available standards. To verify the initial calibration, EPA knowns are analyzed and must be within ±10% of the true value. At a frequency of 10% a continuing calibration standard is analyzed and quantitated. If the continuing calibration standard is not within 10% the instrument is recalibrated and the previous 10 samples are reanalyzed. The chemist documents any excursions and continuing calibration on the bench analysis log.

Data validation practices will be followed to insure that raw data are not altered and that an audit trail is developed for those data which require reduction. The field data, such as those generated during field measurements, will be entered directly into a bound field notebook. Each project team member will be responsible for proofing all data transfers made.

OBG Labs group leaders will check and validate all data generated by their group as specified in Attachment 1. The QAO of the laboratory will provide a signed document verifying the validation of the data.

Upon receipt of OBG Labs Analysis Reports and associated data packages, laboratory analyses will be validated by O'Brien & Gere's Quality Assurance Coordinator by reviewing the laboratory quality control data, laboratory method blanks, trip blanks, agreement between samples and duplicates, and surrogate and spike recovery data.

The analytical data obtained during the course of the investigation for ground and surface waters will be reported as ug/L (ppb). Laboratory data for soil analyses will be reported as ug/kg on a dry weight basis. Analyses conducted in association with the investigation will be reported utilizing OBG Laboratories level two data package. Table B-5 lists the deliverables that are included in the OBG Labs data package.

The validation program will incorporate a tracking and filing system for documents generated during the investigation. Documents accounted for in this aspect of the validation program will include items such as log books, field data records, correspondences, chain-of-custody records, analytical reports, photographs, computer disks, and reports. The Project Manager is responsible for maintaining a central file in which documents will be inventoried. The raw data generated during field operations will be filed to eliminate or correct errors arising from the transfer of data.

To avoid errors in the transfer of data, copies of raw data from the field notebooks, and the data as received from the laboratory, will be entered into a data file and assigned an appropriate document

control identification number. The data file will serve as the ultimate archive for all information and data generated during this investigation.

The documentation of sample collection will include the use of bound field log books in which the information on sample collection will be entered in indelible ink. Enough information will be given to reconstruct the sampling event, including: site name (on each page), sample identification, brief description of sample, date and time of collection, sampling methodology, field measurements and observations, and sampler's initials (bottom of each page, and dated).

SECTION 9 - INTERNAL QUALITY CONTROL CHECKS

9.01 Laboratory Internal Quality Control Checks

OBG Laboratories Internal Quality Control Checks will meet or exceed analytical QC requirements set forth by USEPA approved methodologies (e.g. Test Methods for Evaluating Solid Wastes, EPA, 1986). These QC checks will be a continuation of O'Brien & Gere's Field Internal Quality Control Checks presented below.

9.02 Field Internal Quality Control Checks

Field Internal Quality Control Checks will be utilized during this investigation through the use of the following:

- Trip Blanks - These blanks consist of ultrapure, deionized water contained in appropriate sample containers with any preservatives required for the analysis. These blanks will be provided by OBG Labs. They will accompany the samplers during the sampling process and will serve as a QC check on container cleanliness, external contamination, and the analytical method. Trip blanks will be submitted once per day per analysis type for samples involving ground water. A volatile trip blank will be submitted daily for soil/sediment samples.
- Field Equipment Rinse Blanks - These blanks will consist of demonstrated analyte free water passed through sampling equipment and collected in appropriate containers. These blanks will verify decontamination of sampling equipment and eliminate the possibility of cross-contamination. Equipment

blanks will be collected once daily per analysis type for each type of sampling equipment used.

- Duplicate Samples - Duplicate samples will be collected to allow determination of analytical repeatability. One duplicate sample in every twenty (20) ground and surface water samples collected, and one in every twenty (20) soil or sediment samples, will be collected and submitted for analysis. These samples may be run as matrix spike duplicates (see below).
- Matrix Spike Sample - A matrix spike sample will also be submitted as a further QC check. These will be collected at the same frequency as stated above for the duplicate samples. These will allow recovery rates of compounds (the spike and/or surrogate spike compounds defined in the organic and inorganic methods) to be determined for matrix effects specific to the study site through the addition of known concentrations of compounds into the sample (by OBG Labs at the laboratory) and then performing the analysis.

Therefore, from the above discussion, every twentieth sample or five percent, whichever is more frequent, will be analyzed in duplicate (or matrix spike duplicate) and run as a matrix spike sample.

Duplicate and matrix spike samples will be acquired for ground and surface waters by collecting sequential grab samples after collection of the actual sample. Soil duplicate and matrix spike samples will be collected by splitting the sample between the sample container, duplicate container, and matrix spike container. If insufficient soil sample is present at a particular location to collect the three sample volumes, a

single liter sample will be split at the laboratory for duplicate and matrix spike analysis.

SECTION 10 - PERFORMANCE AND SYSTEM AUDITS

10.01 On-Site Audit

An on-site system audit will be performed during major field activities to review all field-related quality assurance activities. The system audit will be conducted by O'Brien & Gere's Quality Assurance Coordinator.

Specific elements of the on-site audit include the verification of:

- Completeness and accuracy of sample Chain-of-Custody forms, including documentation of times, dates, transaction descriptions, and signatures.
- Completeness and accuracy of sample identification labels, including notation of time, date, location, type of sample, person collecting sample, preservation method used, and type of testing required.
- Completeness and accuracy of field notebooks, including documentation of times, dates, drillers names, sampling method used, sampling locations, number of samples taken, name of person collecting samples, types of samples, results of field measurements, soil logs, and any problems encountered during sampling.
- Adherence to health and safety guidelines outlined in the Site Health and Safety Plan including wearing of proper protective clothing.
- Adherence to decontamination procedures outlined in Section 4 of this QAPP, including proper decontamination of pumps and pump tubing, bailers, and soil sampling equipment.

- Adherence to sample collection, preparation, preservation, and storage procedures.

10.02 Laboratory Audit

10.02.1 OBC Laboratories Internal Laboratory Audits

OBC Labs performs regular system and performance audits. O'Brien & Gere's Quality Assurance Coordinator will also conduct a system audit of the laboratory once during the project to evaluate whether proper quality assurance measures are being incorporated into the sample handling and analysis. Table B-6 lists the checklist that will be used for the system audit.

Results of both the field and laboratory audit will be submitted to O'Brien & Gere's Project Manager and Quality Assurance Coordinator for review and incorporation into the status reports prepared by O'Brien & Gere.

If the results of the audit necessitate further action, the Project Manager will be notified of such and will be appraised of any action taken.

SECTION 11 - PREVENTIVE MAINTENANCE

11.01 Laboratory Maintenance

Standard operating procedures for maintenance, including specific routine and preventive procedures, and maintenance logs for all analytical instruments are employed at OBG Labs according to manufacturers recommendations.

11.02 Field Maintenance

O'Brien & Gere's field equipment is maintained regularly according to the manufacturers specifications. When damaged equipment or equipment in need of repair is returned to the equipment warehouse, it is appropriately flagged for the required maintenance to be performed. This process assures only operable and maintained equipment enters the field. Routine daily maintenance procedures conducted in the field will include:

- Removal of surface dirt and debris from exposed surfaces of the sampling equipment and measurement systems.
- Cleaning of filters in the organic vapor analyzer.
- Storage of equipment away from the elements.
- Daily inspections of sampling equipment and measurement systems for possible problems (e.g. cracked or clogged lines or tubing or weak batteries).

Spare and replacement parts stored in the field to minimize downtime include:

- Appropriate size batteries
- Locks

- Extra sample containers
- Bailer line
- Additional stainless steel bailers
- Additional equipment as necessary for the field tasks.

SECTION 12 - SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

12.01 O'Brien & Gere's Data Quality Assessment

O'Brien & Gere's Quality Assurance Coordinator will review and validate all data as it is received. This validated data will then be incorporated into the next report to be submitted.

The data will be checked by OBG Labs prior to its release to O'Brien & Gere. The main objective of O'Brien & Gere's Quality Assurance Coordinator will be to insure that errors have not been made. This will be accomplished by checking all quality assurance precision and accuracy data and insuring that data packages are complete with information such as:

- Title page
- Chain-of-custody records
- Analytical reports
- Quality control data summary
- Chromatograms
- Methodology summary
- Calibration data

Quality control summary forms will be checked to the specified limits in the required methods. If outliers exist, it will be determined what corrective measures were used to locate the problem or determine if it was sample matrix interference. The following documents will be used in support of the data quality assessment review:

- EPA Region III Data Validation Checklist

- EPA 600/4-79-019, "Handbook for Analytical Quality Control in Water and Wastewater Laboratories".
- Technical Directive Document No. HQ-8410-01, "Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses".
- EPA 600/4-79-020, "Methods for Chemical Analysis of Water And Wastes".
- Federal Register, Friday, October 26, 1984.
- CLP - Statement of Work 7/87.

12.02 Field Data Quality Assessment

To ensure that all field data are collected accurately and correctly, specific written instructions will be issued to all personnel involved in field data acquisition by the Project Manager. The Quality Assurance Coordinator will then review the field books used by project personnel to insure that all tasks were performed as specified in the instructions.

All raw data and reduced data will be submitted by project personnel to the Quality Assurance Coordinator for review. The Quality Assurance Coordinator will then submit these data to the Project Manager for use after all aspects of the data have been approved, initialed, and dated by the Quality Assurance Coordinator. Equations, calculations, data transfers, consistent units and significant figures will all be subject to this quality assurance review.

SECTION 13 - CORRECTIVE ACTION

Corrective action procedures that might be implemented from audit results or upon detection of data unacceptability will be developed on a case-by-case basis. Generally, the following actions may be taken:

1. The reason for the unacceptable data point(s) will be determined as follows:
   a. Precision
      i. The analyst
      ii. Nature of the sample
      iii. Glassware contamination
   b. Accuracy
      i. The analyst
      ii. Glassware contamination
      iii. Contaminated reagents
      iv. Instrument problems
      v. Sample interference with spiked material
2. The corrective actions to be taken may include:
   - Reanalyzing samples if holding times have not been exceeded.
   - Altering field or handling procedures.
   - Resampling.
   - Using a different batch of sample containers.
   - Recommending an audit of laboratory procedures.
   - Accepting data with know levels of uncertainty.
   - Discarding data.

Problems encountered during the study affecting quality assurance will be reported on a Corrective Action Form. The Project Manager and the OBG Labs QA Coordinator will be responsible for initiating the corrective actions in the field and laboratory, respectively, in a timely manner. The Project Manager will report to the Quality Assurance Coordinator on the corrective actions taken, the outcome of these actions, and their effect on data produced. Corrective actions will be discussed in the quality assurance report to management described in Section 14.

SECTION 14 - QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Project Manager, in conjunction with the Quality Assurance Coordinator, will submit, in the investigation reports, summaries of all applicable quality assurance activities. These summaries will contain at least the following types of information.

- The status and coverage of various laboratory and field quality assurance project activities.
- Data quality controls including assessment of: accuracy, precision, completeness, representativeness, and comparability.
- Significant quality assurance problems discovered, corrective actions taken, progress and improvements, plans, and recommendations for further implementation or updating of the investigative QAPP.
- Any significant irregularities noted in the field notebook during the sampling procedure.
- Results of performance and system audits, if conducted.
- A discussion of the QA/QC data as it relates to the data quality objectives of the investigation and the interpretation of the results of the field investigation.

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ATTACHMENT B-1

STANDARD OPERATING PROCEDURES
FOR THE COLLECTION OF
ENVIRONMENTAL SAMPLES

SURFACE SOIL/SHALLOW SEDIMENT SAMPLING PROTOCOL

Sampling Procedures

The soil or sediment sample will be collected by driving a split barrel sampler into soil or sediment to a depth of 12 inches. Each sample shall be composited for the full depth of the sampler and placed in the appropriate sample container. Samples for volatile organics will be placed in appropriate containers prior to compositing.

The sample shall consist only of mineral soil. If sod layers are encountered, such as grass, remove the vegetative sod material.

SOIL BORING PROTOCOL

I. Drilling/Sampling Procedures

Test borings shall be completed using the hollow stem auger drilling method to a depth specified by the supervising hydrogeologist.

If a hollow stem auger drilling method is to be utilized for 2-inch diameter monitoring well completion, the minimum inside diameter of the augers shall be 3-3.4 inches.

Samples of the encountered subsurface materials shall be collected continuously from the ground surface to the water table. The sampling method employed shall be ASTM Method D-1586-84/Split Barrel Sampling using either a standard 2 ft. long, 2 in. outside diameter split spoon sampler with a 140 lb. hammer or a 3 in. outside diameter sampler with a 300 lb. hammer. Upon retrieval of the sampling barrel, the collected sample shall be placed in glass jars and labelled for possible testing. If laboratory soil samples are to be analyzed samples shall be placed in the laboratory sample containers as specified by the supervising hydrogeologist, labeled and placed on ice. A portion of each sample shall be placed in a glass jar, covered with aluminum soil and a screw on cap. This sample shall be allowed to reach ambient air temperature for field screening. Chain of custody procedures will be practiced following Section 15, EPA-600/4-82-029. (Handbook for Sampling and Sample Preservation of Water and Wastewaters).

If sample screening procedures are desired, the samples shall be allowed to reach ambient air temperatures at which time an photoionization detection (HNU Model PI-101 or equivalent) will be used to screen the samples in the field for relative levels of volatile organics. Upon completion of the screening procedure, the samples will be placed in storage.

A hydrogeologist will be on site during the drilling operations to fully describe each soil sample including 1) soil type, 2) color, 3) percent recovery, 4) moisture content, 5) odor and 6) miscellaneous observations such as organic content. The supervising hydrogeologist will be responsible for retaining a representative portion of each sample in a one pint glass jar labelled with 1) site, 2) boring number 3) interval sample/interval preserved, 4) date, and 5) time of sample collection.

The drilling contractor will be responsible for obtaining accurate and representative samples, informing the supervising hydrogeologist of changes in drilling pressure, keeping a separate general log of soils encountered including blow counts (i.e. the number of blows from a soil sampling drive weight (140 pounds) required to drive the split spoon sampler in 6-inch increments.

To prevent cross contamination of soil samples, the split spoon samplers will be cleaned between samples and the drilling equipment (i.e. augers, casing and rods) will be decontaminated between borings. All

decontamination procedures will be in accordance with the Decontamination Protocol.

Those soil borings which are not to be converted to monitor wells will be backfilled upon completion. The backfilling procedure will consist of a bentonite/cement grout tremied into the borehole from the bottom and continued until the grout flows out at the surface.

SURFACE WATER SAMPLING PROTOCOL

When sampling from an open body of water (stream or pond) care must be exercised to collect a representative sample. The sample should cause as little disturbance to the water body as possible. Avoid taking a sample of water which shows evidence of sediment, debris or other material which may have been stirred up by the presence of the sampler.

Surface Water Sampling

Surface water samples should be taken from 3 to 5 (or more) points spaced equally across the width of the stream of pond. The specific number of points should be adequate to accurately reflect the size of the water body being sampled. The samples may then be composited into a single sample for analysis dependent upon the intent of the sampling program. For small, shallow streams, a single sample, collected just below the surface at the stream's midpoint may be adequate for sampling and analyses purposes.

Whether samples are obtained from a boat, a bridge, or by wading into the water body, samples should be taken while facing upstream, away from the influence of the sampler on stream flow.

Collection is accomplished by submerging a clean container at the sampling point to the depth required. For deep streams or ponds, a Kemmer, VanDorn or other sampler specifically designed for this purpose may be used. For shallow (i.e. less than three feet deep) locations, an inverted sample container may be carefully submerged by hand and then slowly allowed to fill.

Samples should then be placed in the proper containers, preserved as necessary for the analyses to be run and stored in an insulated ice cooler at 4°C. All pertinent information should be recorded including sample data and location, sample identification and chain-of-custody forms.

OVERBURDEN DRILLING/SAMPLING PROTOCOL FOR SHALLOW MONITORING WELL COMPLETION

I. Drilling/Sampling Procedures

Test borings shall be completed using the hollow stem auger drilling method or air or fluid rotary drilling method to a depth specified by the supervising geologist/engineer.

If a hollow stem auger drilling method is to be utilized for diameter monitoring well completion, the minimum inside diameter of the augers shall be 3-3/4 inches.

Samples of the encountered subsurface materials shall be collected at a minimum of every five (5) feet and/or change in material or at the discretion of the supervising geologist. The sampling method employed shall be ASTM D-1586-84/Split Barrel Sampling using either a standard 2' long, 2" outside diameter split spoon sampler with a 140 lb. hammer or a 3" outside diameter sampler with a 300 lb. hammer. Upon retrieval of the sampling barrel, the collected sample shall be placed in glass jars and labelled, stored on site (on ice in a cooler if necessary), and transmitted to the appropriate testing laboratory or storage facility. Chain of custody procedures will be practiced following Section 15, EPA-600/4-82-029, Handbook for Sampling and Sample Preservation of Water and Waste Waters.

A geologist will be on site during the drilling operations to fully describe each soil sample including 1) Soil type, 2) color, 3) percent recovery, 4) moisture content, 5) odor and 6) miscellaneous observations such as organic content. The supervising geologist will be responsible for retaining a representative portion of each sample in a one pint glass jar labelled with 1) site, 2) boring number 3) interval sample/interval preserved, 4) date, and 5) time of sample collection.

The drilling contractor will be responsible for obtaining accurate and representative samples, informing the supervising geologist of changes in drilling pressure, keeping a separate general log of soils encountered including blow counts (i.e. the number of blows from a soil sampling drive weight (140 pounds) required to drive the split spoon sampler in 6-inch increments and installing monitoring wells to levels directed by the supervising geologist following specifications further outlined in this protocol.

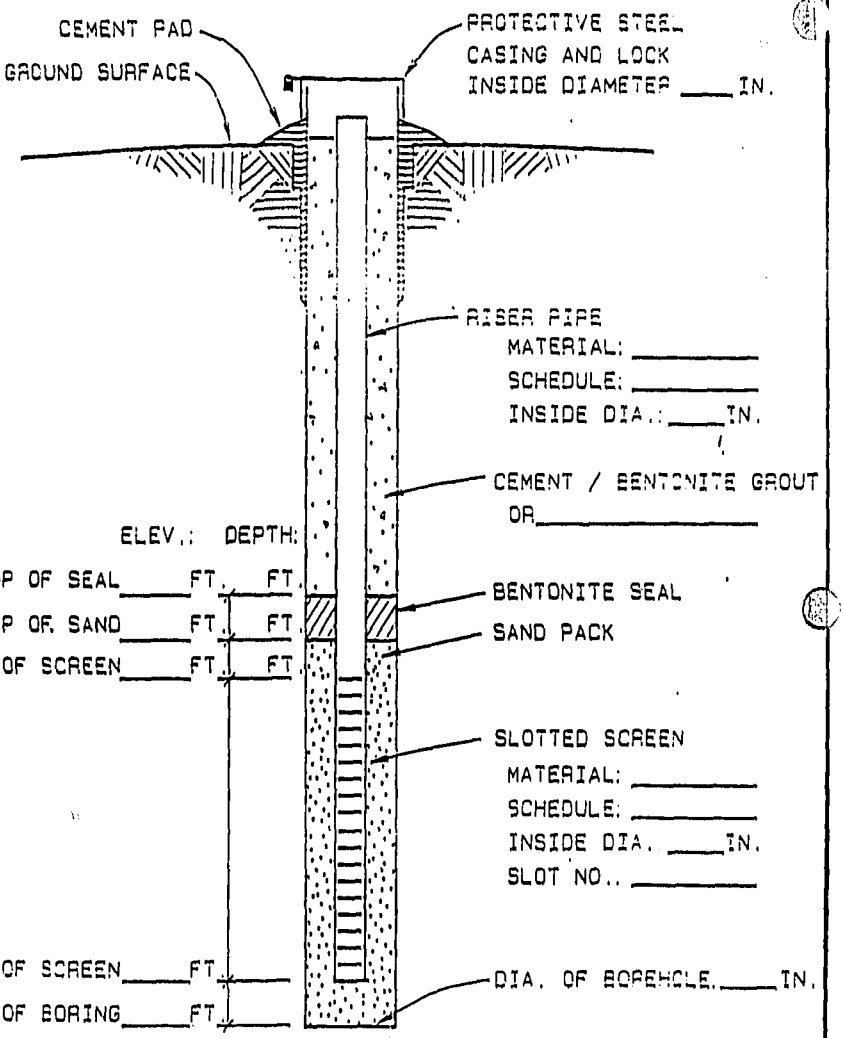
II. Monitoring Well Completion

All monitoring wells will be constructed of ten (10) feet of 2 inch ID 0.010 or 0.020 inch slot (TIMCO or equivalent) Schedule 40 PVC well screen and a riser casing that will extend from the screened interval to 2-3 ft above existing grade. The screen slot size and sand pack will be selected based on the site soils. Other materials utilized for completion will be washed silica sand (Q-Rock Number 4 or approved equivalent) bentonite grout, Portland Cement and a protective steel locking well casing and cap with locks.

The monitoring well installation method for 2 inch wells installed within unconsolidated sediments shall be to place the screen and riser assembly into the casing once the screen interval has been selected. At that time a washed silica sand pack will be placed around the well screen if required to prevent screen plugging. If a sand pack is not warranted, the auger string will be pulled back to allow the native aquifer material to collapse 2-3 ft above the top of the screen. Bentonite pellets will then be added to the annulus between the casing and the inside auger to insure proper sealing. Cement Bentonite grout will continue to be added during the extraction of the augers until the entire aquifer thickness has been sufficiently sealed off from horizontal and/or vertical flow above the screened interval. During placement of sand and bentonite pellets frequent measurements will be made to check the height of the sand pack and thickness of bentonite layers by a weighted drop tape measure.

A vented protective steel casing shall be located over the PVC standpipe extending 2 ft below grade and 2-3 ft above grade secured by a Portland Cement seal. The cement seal shall extend laterally at least 1 ft in all directions from the protective casing and shall slope gently away to drain water away from the well. A vented steel cap will be fitted on the protective casing. The cap shall be constructed so it may be secured with a steel lock.

A typical monitoring well detail is attached. The supervising geologist shall specify the monitoring well design to the Drilling Contractor before installation.



OVERBURDEN MONITOR WELL

N.T.S.

BEDROCK MONITORING WELL DRILLING/INSTALLATION PROTOCOL

1. Bedrock Monitoring Well Completion

Borings shall be completed through the overburden and bedrock using conventional air or fluid rotary methods to a depth as directed by the supervising hydrogeologist.

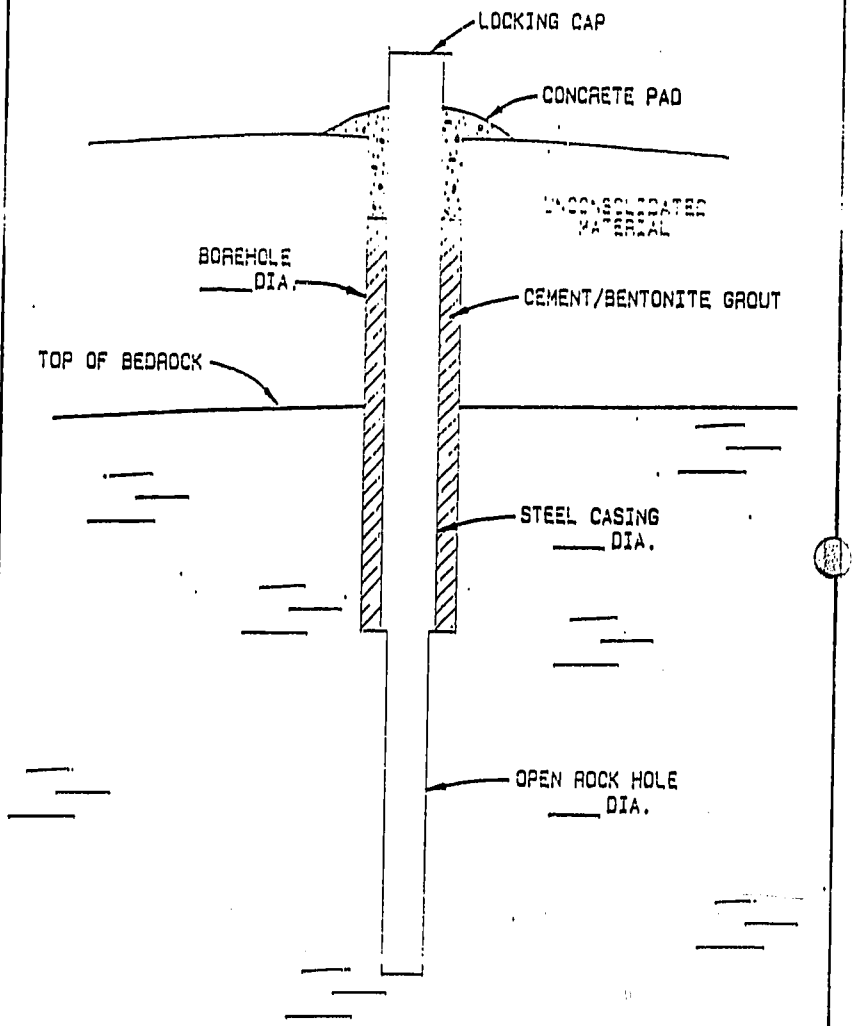
The minimum diameter of the completed boring shall be six (6) inches.

A 4 inch or larger if the borehole diameter is larger steel casing shall be set to a minimum of two feet into the top of bedrock or as specified by the supervising hydrogeologist and extend one to three feet above existing grade. This casing should be adaptable for installation of a locking cover.

The annular space between the casing and borehole wall shall be grouted to the surface using cement and 10% bentonite mixture.

The bedrock will subsequently be drilled using conventional air or fluid rotary or percussion hammer methods. The resulting minimum nominal borehole diameter shall be 4 inches. The borehole shall be completed to a depth specified by the supervising hydrogeologist.

Water from a controlled source shall be allowed to be introduced into the borehole during drilling for cuttings displacement and for tool cooling.



TYPICAL BEDROCK MONITORING WELL

(NOT TO SCALE)

AR100488

DECONTAMINATION PROTOCOL

All drilling equipment and associated tools including augers, drill bits, drill rods, sampling equipment, wrenches and any other equipment or tools that have come in contact with contaminated materials shall be decontaminated. The decontamination procedure shall be to use a high pressure steam cleaner to remove soils and volatilize organics from the equipment. The water used for this procedure shall come from a controlled source.

The frequency of the decontamination will be determined by the supervising hydrogeologist. At a minimum, the decontamination will be performed prior to the drilling of the drilling program prior to removing the equipment from the site.

All soil sampling equipment will be decontaminated using a low phosphate detergent and water wash, potable water rinse, methanol rinse and a final deionized water rinse. If soil samples are to be collected for heavy metal analysis 1% nitric acid will supplement or replace the methanol rinse. Sampling equipment decontamination will be performed between samples.

WELL DEVELOPMENT PROTOCOL

All monitoring wells will be developed or cleared of all fine grained materials and sediments that have settled in or around the well during installation to insure the screen is transmitting representative portions of the ground water. The development will be by one of three methods, air surging, pumping or bailing ground water from the well until it yields, relatively sediment free water.

Air surging will consist of a clean polypropylene tubing extended to the screen portion of the well, attached to an air compressor and allowed to surge until ground water clears. Clean polypropylene tubing will be used for each well developed by this method.

In pumping or bailing a decontaminated pump or bailer will be used followed procedures outlined in the Decontamination protocol and subsequently decontaminated after each use. Ground water will be pumped from the top of the water column using a pump or bailed using a stainless steel bailer. Clean plastic will be placed on the ground to avoid surface contamination and new polypropylene rope on the bailer will be used for each well. Pumping or bailing will cease when the ground water yields sediment free water.

IN-SITU PERMEABILITY TESTING PROTOCOL

The tests will be performed by removing water from the monitoring well in order to create a sufficient hydraulic gradient between the monitoring well and aquifer. The rate of change in water levels will be recorded and analyzed using Hvorslevs method.

If no significant drawdown can be obtained by removing water from the monitoring well an Enviro-Labs Model DL-[illegible]-VCP pressure transducer system will be utilized. This test will involve inserting a teflon rod into the well in order to create a positive potential between the well and aquifer. After the Enviro-Labs system records the response to the positive potential, the teflon rod will be removed in order to create a negative hydraulic potential between the well and aquifer. The rate of ground water recovery will then be recorded using the Environ-Labs system. The data collected from both the positive displacement (slug) and negative displacement will be analyzed using Hvorslev's or Papadopolous' method.

All equipment which comes in contact with the monitoring well be decontaminated with a methanol swabbing and distilled water rinse-between each monitoring well.

GROUND WATER SAMPLING PROTOCOL

Prior to obtaining ground water samples for laboratory analysis, all monitoring wells must be developed as described in the Well Development Protocol.

Sampling Procedures

Use of the following procedures for the sampling of ground water observation wells is dependent upon the size and depth of the well to be sampled and the volume of ground water in the well. To obtain representative ground water samples from wells containing only a few gallons of ground water, the bailing procedures is preferred. To obtain representative ground water samples from wells containing more than a few gallons, the pumping procedure generally facilitates more rapid sampling. Each of these procedures is explained in detail below.

A. Sampling Procedures (BAILER)

1. Identify the well and record the location on the Ground Water Sampling Field Log, Attachment A.

2. Put on a new pair of disposable gloves.

3. Cut a slit in the center of the plastic sheet, and slip it over the well creating a clean surface onto which the sampling equipment can be positioned.

4. Clean all meters, tools, equipment, etc., before placing on the plastic sheet.

5. Disposable shoe covers should be placed over the samplers shoes to prevent potential contamination from dirty shoes contacting the plastic sheet. Do not kick, transfer, drop, or in any way let soils or other materials fall onto this plastic sheet unless it comes from inside the well.

6. Clean the wall cap with a clean towel, and remove the well cap, and plug placing both on the plastic sheet.

7. Using an electric well probe, measure the depth to the water table and the bottom of the well. Record this information in the Ground Water Sampling Field Log.

8. Clean the well depth probe with a methanol soaked towel and rinse it with distilled water after use.

9. Compute the volume of water in the well, and record this volume on the Ground Water Sampling Field Log.

10. Attach enough polypropylene rope to a bailer to reach the bottom of the well, and lower the bailer slowly into the well

making certain to submerge it only far enough to fill one-half full. The purpose of this is to recover any oil film, if one is present on the water table.

11. Pull the bailer out of the well keeping the polypropylene rope on the plastic sheet. Empty the ground water from the bailer into a glass quart container and observe its appearance. NOTE: This sample will not undergo laboratory analysis, and is collected to observe the physical appearance of the ground water only.

12. Record the physical appearance of the ground water on the Ground Water Sampling Field Log.

13. Lower the bailer to the bottom of the well, and agitate the bailer up and down to resuspend any material settled in the well.

14. Initiate bailing the well from the well top making certain to keep the polypropylene rope on the plastic sheet. All ground water should be dumped from the bailer into a graduate pail to measure the quantity of water removed from the well.

15. Continue bailing the well from the top of the water column until a sufficient volume of ground water in the well has been removed, or until the well is bailed dry. If the well is bailed dry, allow sufficient time for the well to recover before proceeding with Step 16. Record this information on the Ground Water Sampling Field Log.

16. Remove the sampling bottles from their transport containers, and prepare the bottles for receiving samples. Inspect all labels to insure proper sample identification. Sample bottles should be kept cool with their caps on until they are ready to receive samples. Arrange the sampling containers to allow for convenient filling. Always fill the containers labeled purgeable priority pollutant first. Filter and add preservatives to appropriate samples.

17. To minimize agitation of the water in the well, initiate sampling by lowering the bailer slowly into the well making certain to submerged it only far enough to fill it completely. Fill each sample container following the instructions listed in the Sample Containerization Procedures, Attachment B. Return each sample bottle to its proper transport container.

18. If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled. The vials (3) labeled purgeable priority pollutant analysis should be filled from one bailer then securely capped. NOTE: Samples must not be allowed to freeze.

19. Record the physical appearance of the ground water observed during sampling on the Ground Water Sampling Field Log.

20. After the last sample has been collected, record the date and time, and, and if required, empty one bailer of water from the surface of the water in the well into the 200 ml beaker and measure and record the pH, conductivity and temperature of the ground water following the procedures outlined in the equipment operation manuals. Record this information on the Ground Water Sampling Field Log. The 200 ml beaker must then be rinsed with distilled water prior to reuse.

21. Begin the Chain of Custody Record. A separate form is required for each well with the required analysis listed individually.

22. Replace the well cap, and lock the well protection assembly before leaving the well location.

23. Place the polypropylene rope, gloves, rags, and plastic sheeting into a plastic bag for disposal.

24. Clean the bailer by rinsing with control water, methanol and/or 1% nitric acid, deionized water. Store the clean bailer in a fresh plastic bag.

B. Sampling Procedures (PUMP)

1. Identify the well and record the location on the Ground Water Sampling Field Log.

2. Put on a new pair of disposable gloves.

3. Cut a slit in the center of the plastic sheet, and slip it over the well creating a clean surface onto which the sampling equipment can be positioned.

4. Clean all meters, tools, equipment, etc., before placing on the plastic sheet.

5. Disposable shoe covers should be placed over the samplers shoes to prevent potential contamination from dirty shoes contacting the plastic sheet. Do not kick, transfer, drop, or in any way let soils or other materials fall onto this plastic sheet unless it comes from inside the well.

6. Clean the wall cap with a clean towel, and remove the well cap, and plug placing both on the plastic sheet.

7. Using an electric well probe, measure the depth to the water table and the bottom of the well. Record this information in the Ground Water Sampling Field Log.

8. Clean the well depth probe with a methanol soaked towel and rinse it with distilled water after use.

9. Compute the volume of water in the well, and record this volume on the Field Log.

10. Attach enough polypropylene rope to a bailer to reach the bottom of the well, and lower the bailer slowly into the well making certain to submerge it only far enough to fill one-half full. The purpose of this is to recover any oil film, if one is present on the water table.

11. Pull the bailer out of the well keeping the polypropylene rope on the plastic sheet. Empty the ground water from the bailer into a glass quart container and observe its appearance. NOTE: This sample will not undergo laboratory analysis, and is collected to observe the physical appearance of the ground water only.

12. Record the physical appearance of the ground water on the Ground Water Sampling Field Log.

13. Prepare the pump for operation.

14. Lower the pump to immediately below the water level and pump the ground water into a graduated pail. Pumping should continue until sufficient well volumes have been removed or the well is pumped dry. If the well is pumped dry, allow sufficient time for the well to recover before proceeding with Step 16. Record this information on the Ground Water Sampling Field Log.

15. Remove the sampling bottles from their transport containers, and prepare the bottles for receiving samples. Inspect all labels to insure proper sample identification. Sample bottles should be kept cool with their caps on until they are ready to receive samples. Arrange the sampling containers to allow for convenient filling. Always fill the vials labeled purgeable priority pollutant first. Filter and add preservatives to appropriate samples.

16. To minimize agitation of the water in the well, initiate sampling by lowering the bottom loading stainless steel bailer slowly into the well making certain to submerge it only far enough to fill it completely. Fill each sample container following the instructions listed in the Sample Containerization Procedures. Return each sampling bottle to its proper transport container. NOTE: While filling the sample vial labeled purgeable priority pollutant analysis, insure that the submersible pump intakes are located at a sufficient depth below the surface of the water to insure air is not introduced while filling the vials.

17. If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled. NOTE: Samples must not be allowed to freeze.

18. Record the physical appearance of the ground water observed during sampling on the Ground Water Sampling Field Log.

19. After the last sample has been collected, record the date and time, and, and if required, empty one bailer of water from the surface of the water in the well into the 200 ml beaker and measure and record the pH, conductivity and temperature of the ground water following the procedures outlined in the equipment operation manuals. Record this information on the Ground Water Sampling Field Log. The 200 ml beaker must then be rinsed with acetone and distilled water prior to reuse.

20. Begin the Chain of Custody Record. A separate form is required for each well with the required analysis listed individually.

21. Remove the pump from the well and clean the pumps and necessary tubing both internally and externally. Cleaning is comprised of rinses with potable water. The pump should then be returned to its covered storage box.

22. Replace the well plug, and lock the well protection assembly before leaving the well location.

23. Place the gloves, towels, disposable shoe covers and plastic sheet into a plastic bag for disposal.

ELECTROMAGNETIC SURVEY PROTOCOL

A series of electromagnetic survey lines will be laid out under the direction of the on-site geologist. A measurement of the electromagnetic field strength will be made by the geologist at selected coil lengths along the traverse line with supplementary measurements made if regarded necessary..

The instrument utilized will be a GEONICS EM-31 portable, ELECTRO-MAGNETIC RESISTIVITY METER. The instrument shall be calibrated and operated in accordance with guidelines outlined in the operating manual. A permanent record of readings obtained in millimhos/m will be entered into the geologist's field book for later reduction.

MAGNETOMETER SURVEY PROTOCOL

The magnetometer survey will be performed along survey lines laid out along the ground surface along a grid or travers of previously surveyed points. A measurement of the magnetic field strength shall be made at selected survey stations along the grid or traverse line with supplementary measurements made if regarded necessary. An EG&G Geometrics Model G816-826 Portable Proton Magnetometer will be used.

For all magnetometer surveys on land the following procedures will be followed:

1. Identify boundaries of are to be surveyed.
2. Clear and survey traverse lines and or grid.
3. Identify locations of all surface and subsurface utilities.
4. Document data, weather, personnel, time, and all other relevant data in field note book.
5. Mount magnetometer on back or pole, check battery strength and time.
6. Initiate base station readings at location removed from utilities and site.
7. Take readings along survey grid or traverses. A minimum of three readings will be taken at each station and all will be noted in a field book.
8. All surface ferrous or metallic objects will be noted in a field book.
9. Base station readings will be taken and time noted roughly every hour during survey. Base station readings will be taken at the completion of the survey.

TABLE B-1

RECOMMENDED HOLDING TIMES FOR ANALYSES
TO BE CONDUCTED ON SAMPLES FOR THE
ORDINANCE PRODUCTS, INC. SITE

Sample Analysis [1]	Water	Soil/Sediment	Air
1. Target Compound List Volatile Organics	10 days of VTSR	10 days	14 days
2. Target Compound List Semivolatile Organics	5 days from VTSR until extraction 40 days after VTSR	10 days until extraction 40 days after VTSR	
3. Target Compound List Pesticides/PCBs	5 days until extraction 40 days after VTSR	10 days until extraction 40 days after extraction	14 days
4. Metals	6 months (26 days for Hg)	6 months (26 days for Hg)	
5. Cyanide	14 days	6 months	
6. Oil and Grease*	28 days	28 days	
7. Field pH and Conductivity	Measured immediately after sample collection	N/A	

[1] CLP SOW 10/87

* 40 CFR Part 136

VTSR = verified time of sample receipt

TABLE B-2

WELL DEPTHS FOR THE
ORDINANCE PRODUCTS, INC. SITE

Well No.	Total* Depth (feet)
MW-1	———
MW-2	———
MW-3	———
MW-4	———
MW-5	———
MW-6	———
MW-7	———
MW-8	———
MW-9	———
MW-10	———
MW-11	———
MW-12	———

*All wells are 2" diameter.

TABLE B-3

SAMPLE CONTAINERS AND PRESERVATION REQUIREMENTS
FOR ANALYSES IN CONJUNCTION WITH THE
ORDINANCE PRODUCTS, INC. SITE

Analysis	Sample Containers	Preservation
WATER:		
TCL Volatiles	2-40 ml glass vials with teflon backed silicon septum caps	See Note #1
Extractable Organics	4-1 liter amber glass bottles with poly cap	Cool to 4°C
Metals	1-1 liter polyethylene bottle	Field filter w/.45 filter followed by HNO_3 to pH less than or equal to 2
	1-1 liter polyethylene bottle with poly cap	Unfiltered, HNO_3 to pH less than or equal to 2
Cyanide	1-1 litre polyethylene bottle with poly cap	Cool to 4°C NaOH to PH greater than 12
Oil and Grease (EPA 413)	1-1 liter glass bottle with poly cap	5 mls HCL

Note #1: Adjust the pH of the sample Less Than 2 by carefully adding 1:1 HCl drop by drop to the required two (40 ml)VOA sample vials. The number of drops of 1:1 HCl required should be determined on a third portion of sample water of equal volume. Cool to 4°C.

If acidification of the sample causes effervescence, the sample should be submitted without preservation except for cooling to 4°C. This sample property should be appropriately noted when present.

SOIL SAMPLES:

Volatile Organics	2-120 ml wide mouth glass vials	Cool to 4°C
Metals and Cyanide	1-8 oz. wide mouth glass jar with teflon lined phenolic cap	Cool to 4°C

TABLE B-3

SAMPLE CONTAINERS AND PRESERVATION REQUIREMENTS
FOR ANALYSES IN CONJUNCTION WITH THE
ORDINANCE PRODUCTS, INC. SITE
(Continued)

Analysis	Sample Containers	Preservation
SOIL SAMPLES: (Continued)		
Extractable Organics	1-8 oz. wide mouth glass jar with teflon line phenolic cap	Cool to 4°C
Oil and Grease	1-8 oz. wide mouth glass jar with teflon lined phenolic cap	Cool to 4°C

TABLE B-4

CONDUCTIVITY TEMPERATURE CORRECTIONS
FOR 1,413 UMHOS/CM CONDUCTIVITY STANDARD

Temperature, °C	umhos/cm
15	1,141.8
16	1,167.3
17	1,193.6
18	1,219.9
19	1,246.4
20	1,273.0
21	1,299.7
22	1,326.6
23	1,353.6
24	1,380.8
25	1,408.1
26	1,436.5
27	1,463.2
28	1,490.9
29	1,518.7
30	1,546.7

TABLE B-5

OBG LABORATORIES DATA PACKAGE

- Field Chain-of-Custody/Analysis Request Form
- Internal Chain-of-Custody Documentation
- Methodology Summary
- Analytical Results
- Method Blank for Appropriate Analytical Sample Set
- Matrix Spike and Duplicate Analysis Data
- Surrogate Recovery Data
- Appropriate Mass Spectrometer Tuning Data
- Hard Copies (photocopies) of Chromatograms, Associated Mass Spectra, and Any Other Applicable Instrumental Readouts
- Instrumental Calibration Data

TABLE B-6

O'BRIEN & GERE'S SYSTEM AUDIT CHECKLIST FOR OBG LABORATORIES

I. Chain-of-Custody

- Log-In Procedures Evaluated
- Sample Custodian is Assigned and Oversees Sample Transfers
- Sample Routing and Pickup is Documented and Accounted For
- Separate Area for Sample Storage and Maintained in Locked Storage

II. Sample Preparation

- Correct Sample Preparation Procedures are Followed
- Areas Designated for Sample Preparation (Organic and Inorganic)
- Holding Times Maintained

III. QA/QC Procedures

- Procedures are Being Followed According to Methods Specified
- Data Validation and Reduction Processes Reviewed by Group Leaders
- Proper Documentation of QA Procedures
- Internal QC Maintained
- Data Transfers and Reporting Checked by Group Leaders
- Awareness of Personnel of QA Requirements

IV. Equipment Maintenance

- Maintenance Logs are Up-to-Date
- Instrumentation is in Repair
- Reasonable Spare Parts are on Hand

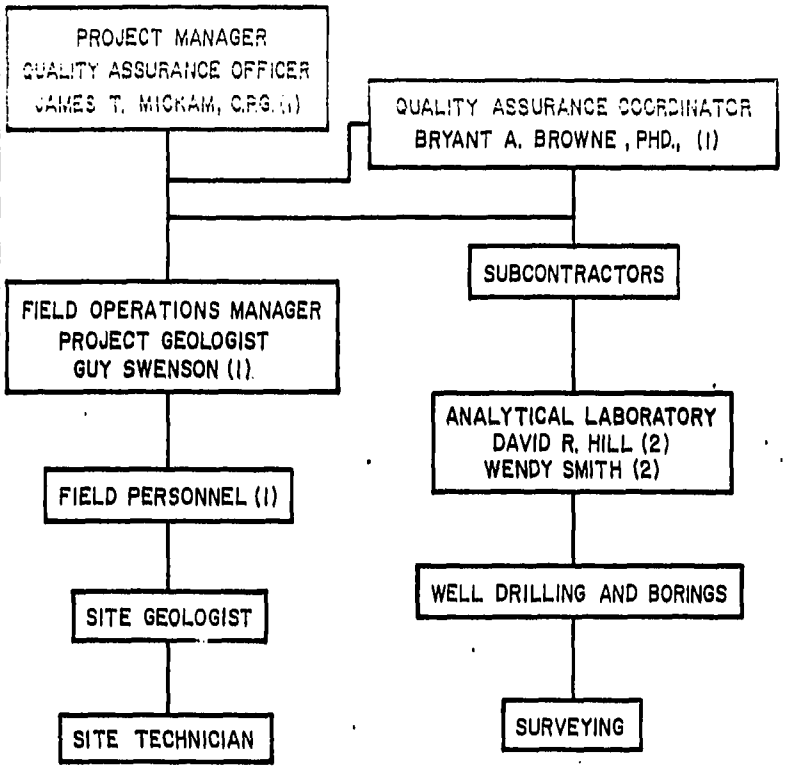
V. Miscellaneous

- Overall Housekeeping in Order
- Certifications Up-to-Date

FIGURES

FIGURE B-1

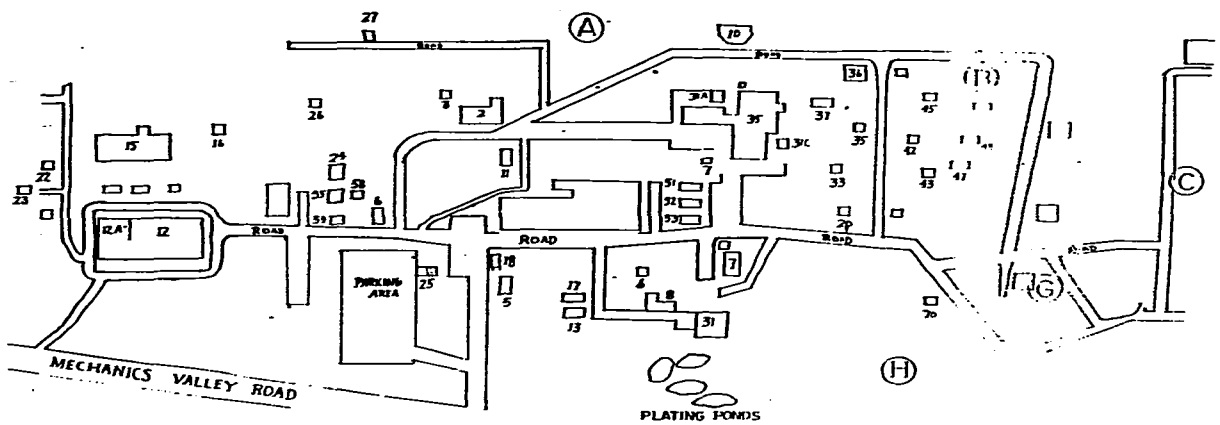
PROJECT ORGANIZATION CHART



(1) OBRIEN & GERE ENGINEERS, INC.

(2) OBG LABORATORIES, INC.

FIGURE B2



A-I AREAS OF CONCERN

O'BRIEN & GERE ENGINEERS, INC.
Syracuse, New York

MECHANICS' VALLEY TRADE CENTER
NORTH EAST MARYLAND
NOTE: NOT TO SCALE

PRJ NO 4057.002
DATE 7-22-88

ARI00508

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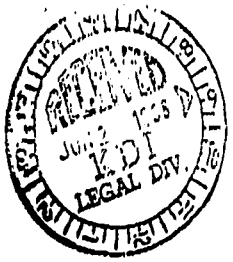
EXHIBIT A

USEPA ADMINISTRATIVE ORDER

AUGUST, 1988

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107



In Reply Refer to: 3HW14

Mr. Kevin Langner
KDI Corporation
5721 Dragon Way
Cincinnati, Ohio 45277

Re: Ordnance Products Inc. Site

Dear Mr. Langner:

Enclosed is a copy of the Unilateral Order executed by the Regional Administrator, Region III, United States Environmental Protection Agency (EPA) concerning the disposal of hazardous substances and the treatment of contaminated groundwater from the above-referenced site. The Order is issued pursuant to the authority of Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. Section 9606(a) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

The terms of this Order require immediate compliance. If you have any questions or comments concerning this Order, please contact Christopher P. Thomas, Environmental Engineer at (215) 597-4458 or Allyn Stern, Office of Regional Counsel at (215) 597-1632.

Sincerely,

Stephen R. Wassersug, Director
Hazardous Waste Management Division

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III

IN THE MATTER OF:	:	
Ordnance Products, Inc. Site	:	
KDI Corporation	:	
RESPONDENT	:	Docket No. III-86-14-DC
Proceeding Under Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. § 9601, et seq.	:	

ADMINISTRATIVE ORDER

I. JURISDICTION

This Order is issued pursuant to the authority vested in the President of the United States by Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), 42 U.S.C. § 9606(a), as amended by the Superfund Amendments and Reauthorization Act of 1986, ("SARA") Pub. L. No. 99-499, 100 Stat. 1613 (1986), and delegated to the Administrator of the United States Environmental Protection Agency (EPA) by Executive Order 12580, 52 Fed. Reg. 2923 (January 23, 1987), and further delegated to the Regional Administrators of EPA.

This Order is issued to KDI Corporation (KDI), which hereinafter may be referred to as the "Respondent."

This Order pertains to property located at 1079 Mechanics Valley Road, north east of the City of North East, Maryland, in Cecil County, Maryland and can be identified on Attachment A2 as Nos. 170/48 87.63A P. 82. The property will hereinafter be referred to as "the Site."

This Order shall apply to and be binding upon the Respondent and its agents, successors and assignees, and upon all persons, contractors, and consultants acting under or for the Respondent.

The actions taken pursuant to this Order shall be consistent with the National Oil and Hazardous Substances Contingency Plan, 40 C.F.R. Section 300.65.

II. STATEMENT OF PURPOSE

In issuing this Order, the objective of EPA is for the Respondent to conduct a removal action, as defined in Section 101(23) of CERCLA, 42 U.S.C. Section 9601(23) to abate, mitigate, and/or eliminate the release or threat of release of hazardous substances at the Site.

III. FINDINGS OF FACT

The following constitutes an outline of the facts upon which this Order is based:

A. Ordnance Products, Inc. (OPI) purchased the Site in 1960. The Site was used by OPI to manufacture, store and pack explosives and ammunition.

B. KDI Corporation, Inc., (KDI) is a corporation incorporated in the State of Delaware.

C. KDI acquired OPI in 1969. A formal corporate merger of OPI into KDI was filed on November 28, 1983. On June 5, 1986, the ownership of the Site was transferred from OPI to KDI. KDI owned and operated the Site from that date until it was sold to Mechanics Valley Trade Center (MVTC) in 1986. The Site was used by KDI to fire explosives and ammunition.

D. Mechanics Valley Trade Center (MVTC) is the current owner of the Site.

E. The Site occupies approximately 94.6 acres of wooded and open terrain. Facilities located on the Site include 58 separate buildings, several trailers, house trailers, and campers. Other features include several ponds, streams, disposal pits, and burn pits. The disposal pits were used by KDI to dispose of explosive waste. The burn pits were used to incinerate explosives.

F. The Maryland Department of the Environment (MDE) has conducted preliminary investigations of the Site. Findings of those investigations include: drums containing unknown liquids stored at the site in an unsafe manner, actual and suspected landfill or burial areas containing hazardous substances including those identified in Item H below, disposal of explosives possibly containing "live" materials, and the contamination and potential contamination of soils, surface water, and groundwater both on and off the Site, with hazardous substances, including those listed in Items G and H below.

G. The MDE preliminary investigations revealed the presence and concentration of the following organic compounds

in a boring sample taken at a pit on the Site:

Tetrachloroethene	278,000 ppb
Trichloroethene (TCE)	17,500 ppb
Trans 1,2 dichloroethene	2,200 ppb
Vinyl Chloride	71 ppb
1,2 dichloroethane	11 ppb

H. The MDE preliminary investigations have also revealed the presence of the following hazardous substances in the onsite water supply wells:

Trichloroethene (TCE)
Tetrachloroethene
Trans 1,2 dichloroethene
Vinyl Chloride

I. MDE issued orders to both MVTC and KDI Corporation to address the threats at the Site, but requested EPA assistance when the work ordered did not take place.

J. EPA Region III's Office of Emergency Response, with assistance from the Roy F. Weston, Inc. Technical Assistance Team (TAT) conducted an assessment of the Site on March 28, 1988. That assessment confirmed the findings of the MDE preliminary investigations set forth in Items F, G, and H above. It was recommended that action be taken to remove the drums from the Site and to ensure security at the burial sites.

K. The Site is currently being developed as an industrial park by MVTC with space and/or buildings currently being leased by MVTC to businesses for manufacturing and storage, private citizens for storage, and one family for a residence. Approximately 100 people could be onsite at one time. There are also several residences within 500 feet of the Site. Vinyl

chloride has been detected in 3 domestic drinking water wells within 1 mile from the Site.

L. There is the potential for direct contact onsite with strong acids due to spillage, for explosion and ingestion of explosive products from disposal areas onsite which are currently unsecured, for ingestion of contaminated drinking water (on and off site), and continued migration of contaminants from the Site.

M. Based on EPA's site assessment and investigations carried out by the MDE, EPA determined that there is the potential for explosion and ingestion of explosive products from disposal areas onsite which are currently unsecured, for ingestion of contaminated drinking water (on and off site), and continued migration of contaminants from the Site.

N. Tetrachloroethene was detected onsite at concentration levels up to 278,000 ppb. Ingestion of soil contaminated with tetrachloroethene in such levels presents a substantial threat to public health, welfare, or the environment. The presence of TCE and vinyl chloride onsite increases the risk to public health.

IV. CONCLUSIONS OF LAW

A. The OPI Site is a facility as defined by Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

B. The Respondent is a person as defined by Section 101(21) of CERCLA 42 U.S.C. § 9601(21).

C. Hazardous Substances, (those compounds listed in items G and H above), as defined in Section 101(14) of CERCLA, 42 U.S.C.

§ 9601(14) have been disposed at the Site and are currently present there.

D. The presence of hazardous substances at the Site and the past, present, and/or potential migration of hazardous substances from the Site constitutes an actual and/or threatened "release" as defined in Section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

E. The Respondent is liable under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a) because it owned or operated the Site at the time hazardous substances, identified in Section III, Items G and H, were disposed of there.

V. DETERMINATIONS

A. The actual and/or threatened release of hazardous substances from the Site may present an imminent and substantial endangerment to the public health or welfare or the environment.

B. The actions required by this Order are necessary to protect the public health and welfare and the environment.

VI. PARTIES BOUND

No change in ownership or corporate or partnership status relating to the Site will in any way alter the status of the Respondent or in any way alter the Respondent's responsibility under this Order. KDI Corporation will remain the Respondent under this Order and will be responsible for carrying out all activities required of the Respondent under this Order.

The Respondent shall provide a copy of this Order to all contractors, sub-contractors, laboratories and consultants

retained to conduct any portion of the work performed pursuant to this Order.

VII. NOTICE TO THE STATE

Notice of issuance of this Order has been given to the State of Maryland, pursuant to Section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

VIII. WORK TO BE PERFORMED

Respondent shall commence performance of the following measures upon the effective date of this Order.

A. Within forty-eight (48) hours of the effective date of this Order, the Respondent shall retain a contractor who must be approved by EPA prior to beginning work. Respondent must inform EPA of its contractor choice within seventy-two (72) hours of the effective date of this Order. This contractor must have experience in hazardous waste removal projects.

B. Within five (5) calendar days of the effective date of this Order, the Respondent shall provide the EPA with a written Work Plan as detailed in C through P below to respond to the following: 1) drum areas, 2) disposal areas, 3) potentially unknown or hazardous materials remaining in onsite buildings, 4) remaining explosives at the Site, 5) installation of water treatment systems, if necessary, and maintenance of all offsite water treatment systems, and 6) implementation of a groundwater extent of contamination study. This Work Plan must be approved by EPA prior to the commencement of work.

C. The Work Plan for the drum areas (denoted as A, B, and C on attachments A_1 and A_2) shall include representative sampling of the drums containing materials and any material on the ground in the vicinity of the drums, and disposal or treatment of the materials including residues consistent with all Federal, State, and local regulations. Any drums containing liquids shall be emptied, the compatibility of all such liquids shall be determined, and all such liquids shall be consolidated for disposal or treatment, provided that the method of consolidation is approved in advance by the EPA Project Coordinator (PC). All empty drums shall be disposed of as hazardous waste or cleaned and disposed of as refuse according to applicable regulations. Samples of consolidated liquid materials shall be taken as required by the disposal/treatment facility.

D. The Work Plan for the suspected disposal areas shall include: 1) a plan for assessment of the contaminants at disposal areas D, E, F, G, H, and I as shown on Attachment A_1, A_2, and B, and excavation of any materials which EPA determines may present an airborne or direct contact threat, and replacement of excavated soil with clean fill material once removal is complete. The site safety plan, referenced in Item 5 below, shall address the threat of airborne releases. The Work Plan shall also contain a plan for revegetation and/or restoration of excavated areas; and 2) systematic identification of disposal areas on the Site, including, but not limited to, interviews of employees, review of aerial photography, and remote sensing. Any areas discovered will be handled according to the procedures under 1 above.

E. The Work Plan for the offsite extent of contamination study shall include provisions to 1) install a groundwater monitoring network to determine the location, extent, and source of the offsite contamination and 2) sample all domestic drinking wells within a 1/2 mile radius of the Site to determine whether the above need treatment systems as described in Item F below.

F. The Respondent shall install an offsite treatment system at each domestic drinking well sampled pursuant to Item E above, at which the concentrations of organic compounds have reached or exceed the limits established by EPA, as shown on Attachment D, for the hazardous substances identified in Section III, Items G and H above. All offsite treatment systems shall be designed as described in Item H below.

G. The Work Plan for the additional offsite treatment system shall include provisions to continue the operation of the systems, and to perform any maintenance necessary to maintain water quality at or better than EPA final or proposed Maximum Contaminant Levels shown on Attachment D.

H. The Work Plan shall also include provisions to operate and maintain, as described in Item G above, the existing water treatment systems at the three residences, listed on Attachment C. Maintenance on all existing and additional systems shall continue until EPA determines that they are no longer necessary. All systems, new or existing, will consist of a water meter, a dual 1.5 cubic feet activated carbon filter unit, and an ultraviolet uni

I. Respondent shall assure that the filter unit contractor can provide adequate replacement components for all treatment systems

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within twenty-four (24) hours after receipt of notice of the need for replacement components.

J. Respondent shall sample all water treatment systems for the compounds listed in Item G and H of Section III above, at the midpoint and at the tap on a weekly basis for a period of one month. For the existing treatment systems Respondent shall commence the weekly sampling within five (5) days of the effective date of this Order. For the additional treatment system identified in Item F above, respondent shall commence the weekly sampling within five (5) days of the date on which the treatment system is installed. Once the weekly sampling period is completed samples shall be taken at the midpoint every six (6) weeks and at the source quarterly. All samples taken shall be analyzed in accordance with EPA Methods 601, 624, 8010, or 8240, as found in EPA Publication SW-846, for the specific compound(s) of concern listed in Section III, Items G & H.

K. Respondent shall notify the EPA PC within twenty-four (24) hours if organic compounds have reached levels at or above proposed and final Maximum Contamination Levels (Attachment D) established by EPA. Once concentrations of organic compounds have reached levels at or above the limits established by EPA, the Respondent shall immediately provide for modification or addition to the existing water treatment systems which will reduce the level of organic compounds to below EPA limits.

L. The Work Plan for buildings 6, 8, 31, 35, and 44 shall include determination of all drain system components, sampling

of those components, and removal of all hazardous substances.

M. The Work Plan for buildings 1, 31, 35, and 45 shall include the identification and proper removal of all hazardous substances located therein.

N. The Work Plan for explosives removal shall include a thorough inspection of the buildings and grounds and the proper removal of all explosives discovered.

O. Respondent shall describe in the Work Plan the means of disposal or treatment for the hazardous substances found on-site. Soil containing tetrachloroethene must be excavated down to at least 50,000 ppb. If Respondent decides to treat or thermally destroy the hazardous substances, the details of the treatment or thermal destruction process must be provided to EPA. EPA must approve the treatment or thermal destruction process before the process is implemented.

P. If the Respondent decides to dispose of the hazardous materials off-site, the hazardous materials must be disposed of in an EPA approved facility and transported by licensed carriers. The generator shall obtain all applicable identification numbers and approvals prior to the transport of materials. All removal, transport, and disposal activities shall be performed in accordance with all applicable Federal, State, and local regulations.

Q. If any materials are disposed of pursuant to paragraphs C, D, L, M, N, O, or P of this Section, the choice of a disposal facility must be approved by EPA. The Respondent must notify the EPA PC no less than five (5) calendar days

prior to disposal to allow EPA to approve or disapprove the facility choice.

R. During the performance of work under this Order, security will be maintained to prevent unauthorized persons from entering into the work zone.

S. All site activities shall be performed in accordance with a safety plan developed by the Respondent, and approved by the EPA Project Coordinator, in conjunction with the Work Plan approval in Item B.

T. Within 30 days of the work completion as described in items A thru R above, the Respondent will present the EPA PC with a written report of all activities performed. This report will be reviewed within 15 days by EPA, to ensure compliance with this Order. Respondent shall supply the EPA PC monthly update reports during the implementation of the requirements of this Order.

U. The Rospondent shall allow an inspection of the Site following the submission of the report. The purpose of this inspection will be for the EPA Project Coordinator to certify the completion of the work in accordance with this Order and the Work Plan. Nothing herein shall be interpreted as limiting EPA's inspection authority under Federal law.

V. The EPA Project Coordinator shall be notified at least five (5) days in advance of any site activities.

IX. DESIGNATED PROJECT COORDINATORS

Respondent must designate a Project Coordinator within 48 hours of the effective date of this Order who shall be responsible for overseeing the implementation of this Order on behalf of Respondent.

The EPA designated Project Coordinator is:

Christopher P. Thomas
EPA Region III (3HW14)
841 Chestnut Building
Philadelphia, PA 19107
(215) 597-4458

The EPA and the Respondent each have the right to change their respective Project Coordinator. Such a change shall be accomplished by notifying the other party in writing at least five (5) calendar days prior to the change. To the maximum extent possible, communications between the Respondent and EPA and all documents, including reports, approvals and other correspondence, concerning the activities performed pursuant to the terms and conditions of this Order, shall be directed through the Project Coordinators.

The EPA-designated Project Coordinator shall have the authority to, inter alia, halt, modify, conduct, or direct any tasks required by this Order and/or undertake any response actions or portions thereof when conditions present or may present a threat to public health or welfare or the environment as set forth in 40 C.F.R. § 300.65(b). The absence of the EPA

Project Coordinator from the area under study pursuant to this Order shall not be cause for the stoppage of work.

X. RECORD PRESERVATION

The Respondent shall preserve, during the pendency of this Order and for a minimum of six (6) years after its termination, all records and documents in their possession which relate in any way to the work performed hereunder, despite any document retention policy to the contrary. After the expiration of this period, Respondent shall notify EPA prior to destruction of any such records or documents. Upon request by EPA, the Respondent shall make available to EPA such records or copies of any records.

The Respondent may assert a claim of business confidentiality covering part or all of the information or documentation requested by or provided under this Order in the manner described in 40 C.F.R. § 2.203(b). Such an assertion shall be adequately substantiated in accordance with 40 C.F.R. § 2.204(e)(4) at the time the assertion is made. Analytical data shall not be claimed as confidential by the Respondent.

Information subject to such a claim will be handled in accordance with the procedures set forth in 40 C.F.R. Part 2, Subpart B. If no such claim of business confidentiality accompanies the information or documentation when it is submitted or made available to EPA, it may be made available to the public by EPA without further notice to the Respondent.

XI. RESERVATION OF RIGHTS

EPA expressly reserves all rights and defenses including but not limited to the right to: seek monetary penalties and punitive damages for any violation of law or this Order; issue additional Orders under CERCLA Section 106(a); take necessary response actions under Section 104(a) of CERCLA, as amended, 42 U.S.C. § 9604(a) and/or bring a civil action under Section 106(a) of CERCLA as amended, 42 U.S.C. §§ 9606(a) and/or Section 107 of CERCLA, as amended, 42 U.S.C. § 9607, and any other applicable Federal law.

EPA expressly reserves its right to disapprove of work performed by the Respondent and to require the Respondent to perform response actions in addition to those required by this Order, if it determines that such actions are necessary.

In the event that the Respondent refuses to perform such additional actions, EPA reserves the right to undertake such actions. In addition, EPA reserves the right to undertake removal and/or remedial actions at any time that such actions are appropriate under the NCP and seek reimbursement for any costs incurred.

XII. QUALITY ASSURANCE

The Respondent shall use quality assurance, quality control, and chain of custody procedures in accordance with the "EPA

NEIC Policies and Procedures Manual" dated May 1978, revised November 1984, EPA Document 330/9-76-001-R and "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," December 1980, QAMS-005/80, while conducting all sample collection and analysis activities required by this Order. The Respondent shall consult with EPA in planning for, and prior to, all sampling and analysis required by the approved Work Plan. Respondent shall at a minimum:

1. Use a laboratory(s) which has a documented quality assurance program that complies with EPA guidance document QAMS-005/80.

2. Ensure that EPA personnel and/or EPA authorized representatives are allowed reasonable access to the laboratory(s) records and personnel utilized by the Respondent for analysis of samples collected pursuant to this Order.

3. The Respondent shall assure that the Quality Assurance Plan (QA plan), which will be included in the Site Work Plan, will be utilized for all sample collection and analysis. This plan will assure that reproducible, consistent, quality data will be produced from sample analysis.

4. All parameters shall be analyzed for using EPA-approved methods.

5. Provide data validation of analyses done by the laboratory(s). This data validation shall determine data usability and shall be performed in accordance with the Functional Guidelines for Data Review for data derived by EPA Contract

Lab Program (CLP) methods, or if another method is used, the data validation shall be performed in accordance with the quality assurance/quality control (QA/QC) data validation criteria set forth in that method. For methods lacking QA/QC data validation protocols the Respondent must establish validation criteria such as those in Section 8 of the EPA Series Methods in 40 C.F.R. § 136. The appropriate quality assurance data validation summary reports should be submitted along with sample data and summary sheets, to the EPA Project Coordinator at the time final sample results are provided to EPA.

XIII. SITE ACCESS

To the extent that property affected by this Order is presently owned or controlled by parties other than the Respondent to this Order, the Respondent will use all reasonable efforts to obtain Site access agreements from the present owners within 10 days of the effective date of this Order. Such agreements shall provide reasonable access for EPA, and the Respondent, and their authorized representatives. In the event that the property owner refuses to provide such access or access agreements are not obtained within the time designated above, whichever occurs sooner, the Respondent shall so notify EPA. The Respondent shall also notify EPA of all efforts to obtain such agreements. EPA may then take steps to provide such access.

EPA and/or its authorized representatives shall have the authority to enter and freely move about all property

of the Respondent subject to this Order at all reasonable times for the purpose of, inter alia: inspecting records, operating logs, and contracts related to the Site; reviewing the progress of the Respondent in carrying out the terms of this Order; conducting such tests as EPA deems necessary; using a camera, sound recording or other documentary type equipment; and verifying the data submitted to EPA by the Respondent. The Respondent shall permit such persons to inspect and copy all records, files, photographs, documents, and other writing, including all sampling and monitoring data, in any way pertaining to work undertaken pursuant to this Order. Nothing herein shall be interpreted as limiting the inspection authority of EPA under federal law.

XIV. EFFECTIVE DATE AND SUBSEQUENT MODIFICATION

The effective date of this Order shall be the date on which it is received by the Respondent.

Any reports, plans, specifications, schedules and attachments required by this Order are, upon approval by EPA, incorporated into this Order. Any noncompliance with such EPA approved reports, plans, specifications, schedules, and attachments shall be considered a failure to achieve the requirements of this Order.

No informal advice, guidance, suggestion, or comment by EPA regarding reports, plans, specifications, schedules, and any other writing submitted by the Respondent will be

construed as relieving the Respondent of its obligation to obtain such formal approval as may be required by this Order.

XV. PENALTIES FOR NON-COMPLIANCE

Respondent is advised that willful violation by failure or refusal to comply with this Order, or any provision thereof, may subject the Respondent pursuant to Section 106(b) of CERCLA, 42 U.S.C. § 9606(b), to a civil penalty of not more than $25,000 for each day in which such violation occurs or such failure to comply continues. Failure to comply with this Order, or any portion thereof, without sufficient cause, may subject Respondent, pursuant to Section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3), to liability for punitive damages in an amount up to three times the amount of any costs incurred by the government as a result of failure by Respondent to take proper action.

XVI. NOTIFICATION OF DELAY

The Respondent shall notify EPA of any delay or anticipated delay in achieving compliance with any requirement of this Order. Such notification shall be made verbally as soon as possible but no later than two (2) business days after Respondent becomes aware or through the exercise of due diligence should become aware of such delay or anticipated delay and in writing no later than seven (7) days after becoming aware of such delay or anticipated delay. The written notification shall describe fully the nature of the delay, the reasons the delay is beyond the control of Respondent, the actions that

will be taken to mitigate, prevent and/or minimize further delay, and the timetable according to which the actions to mitigate, prevent and/or minimize the delay will be taken. The Respondent shall adopt all reasonable measures to avoid or minimize any such delay.

XVII. OTHER CLAIMS

Nothing in this Order shall constitute or be construed as a release from any claim, cause of action or demand in law or equity against any person, firm, partnership, or corporation not bound by this Order for any liability it may have arising out of or relating in any way to the generation, storage, treatment, handling, transportation, release, or disposal of any hazardous substances, hazardous wastes, pollutants, or contaminants found at, taken to, or taken from the Site.

This Order does not constitute any decision on preauthorization of funds under § 111(a)(2) of CERCLA, 42 U.S.C. Section 9611(a)(2).

XVIII. OTHER APPLICABLE LAWS

All actions required to be taken pursuant to this Order shall be undertaken in accordance with the requirements of all applicable local, state, and Federal laws and regulations.

XIX. REQUEST FOR CONFERENCE

Respondent may, within 24 hours of receipt of the signed order, orally contact EPA to request a conference to discuss the terms of this Order. Respondent shall submit written confirmation of any such request within 24 hours of such request.

A request for a conference shall not, however, stay this Order.

XX. REIMBURSEMENT OF COSTS

At the termination of this Order, EPA shall submit to the Respondent an accounting of all response and oversight costs (including indirect costs) incurred by the U.S. Government with respect to this Order. Oversight costs shall consist of all costs incurred by EPA, its agents or contractors in connection with EPA's oversight of the work to be done by the Respondent under the terms of this Order. The Respondent shall, within thirty (30) calendar days of receipt of that accounting, remit a check for the amount of those costs made payable to the Hazardous Substances Response Superfund.

Checks should specifically reference the Site and be addressed to:

EPA-Superfund Accounting
P.O. Box 371003M
Pittsburgh, PA 15251

A copy of the check shall be concurrently sent to the:

Regional Hearing Clerk
U.S. Environmental Protection Agency
Region III
841 Chestnut Building
Philadelphia, PA 19107

XXI. TERMINATION AND SATISFACTION

The provisions of this Order shall be deemed satisfied and this Order shall terminate when EPA determines that the work required of Respondent has been satisfactorily completed, and Respondent have been so notified by EPA in writing.

IT IS SO ORDERED:

By: _____ Date 6/27/88
James M. Seif
Regional Administrator
Region III
U.S. Environmental Protection Agency

I acknowledge that I have received and read this Order and hereby inform EPA of my intention to fully comply with the Order's terms and requirements.

KDI, Inc.:

_____ _____
Signature Date

_____
Name (Print)

_____
Title

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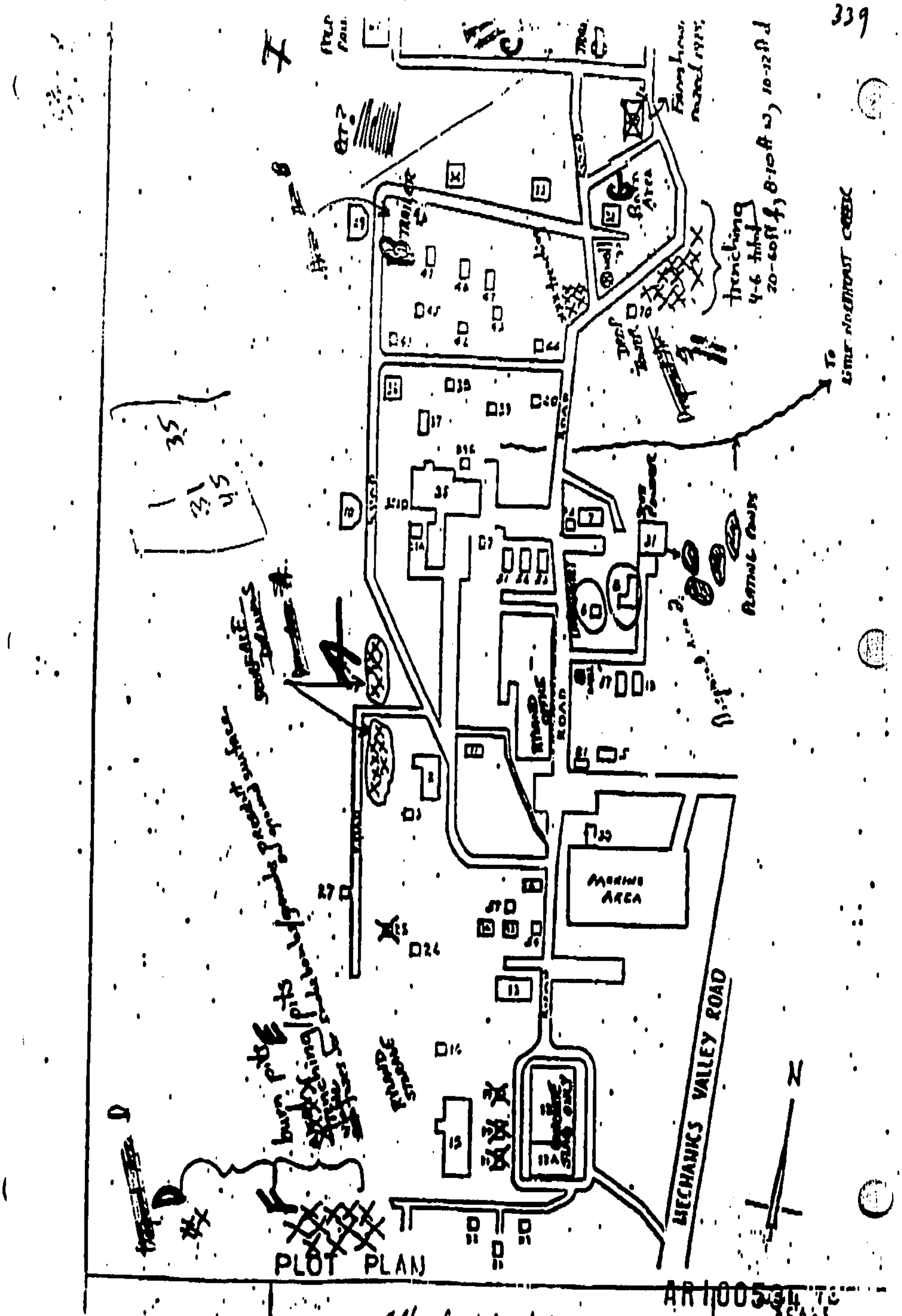

Attachment A1

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